Library

TRANSACTIONS

OF

THE CANADIAN INSTITUTE.

VOLUME I., 1889-90.

TORONTO:
PRINTED FOR THE CANADIAN INSTITUTE
BY THE COPP, CLARK COMPANY, LTD., COLBORNE ST.
1891.

N. Y. Academy
Of Sciences

A1851

PREFATORY NOTE.

The Canadian Institute was incorporated by Royal charter in 1851, and immediately began the publication of a record of its transactions under the name of "The Canadian Journal." The first series was in quarto form and terminated in 1855. It comprised three volumes. The second series was in octavo form, began in 1856 and terminated in 1878. It comprised fifteen volumes. In 1879 the name was changed to "Proceedings of the Canadian Institute," and of this third series seven volumes were issued, terminating in 1890, making in all twenty-five volumes.

The Government of Ontario having three years ago commenced the making of an annual grant to the Institute in aid of archæological research, the annual archæological reports have been published as appendices to the Report of the Minister of Education in the same form as other government reports, and therefore could not be bound up with the "Proceedings." As it was desirable that these Reports should be incorporated with the other publications of the Institute, with the view of attaining this object it has been decided to enlarge the page and issue a new series under the name of "Transactions of the Canadian Institute." The archæological Reports which have already been issued may be bound up with the first volume of the "Transactions," and subsequent ones with the succeeding volumes as they appear.

5415

CONTENTS.

PAGE.

Prefatory Note iii

Royal Charter ix

Presidents of The Canadian Institute. xiii

Officers, 1889-90 xv

Transactions, Session 1889-90 1

Forty-first Annual Meeting 38

Proceedings of The Ornithological Sub-section of The Biological Section 40

Canadian Ornithological Bibliography. 60

Summer Session at Niagara 65

Archæological Remains a Factor in the Study of History 67
DAVID BOYLE, PH. B.

Newark in 1792 72
D. B. READ, Q.C.

Legislative Work of the First Parliament of Upper Canada 77
WILLIAM HOUSTON, M.A.

I. Administration of Justice. 80
II. Municipal Affairs 81
III. Militia and Defence 83
IV. Status of Special Classes of Persons 83
V. Legislation and Administration 84

The Hurons 86
D. B. READ, Q C.

Settlement and Original Survey of Niagara Township 96
WILLIAM CANNIFF, M.D., M.R.C.S., ENG.

Slavery in Canada 102
J. C. HAMILTON, LL.B.

British Legislation touching Colonial Slavery 103
Slavery in Upper Canada 104
Negro Slaves on Ogden Island 106
References 108

Two Frontier Churches 109
JANET CARNOCHAN.

Fort George's Lonely Sycamore 124
JANET CARNOCHAN.

Diary of Gov. Simcoe's Journey from Humber Bay to Matchetache Bay, 1793 128
HON. ALEX. MACDONELL.

Arsenic and Sulphur as Metallurgical Agents in the Treatment of Canadian Auriferous and Argentiferous Ores 141
R. DEWAR.

Some Points in the Natural History of Ground Waters 149
P. H. BRYCE, M.A., M.D.
1. The Source of Ground Water 149
2. Constitution of Ground Waters 154

The Déné Languages 170
REV. FATHER A. G. MORICE, O. M. I.
Introduction 170
Chapter I. Phonetics and Graphic Signs 172
Déné Syllabary 175
Chapter II. General Characteristics 176
Chapter III. The Nouns; their Varieties and Inflections 181
Chapter IV. The Adjectives and the Pronouns 185
Chapter V. The Simple or Primary Verbs 189
Chapter VI. The Composite Verbs 195
Chapter VII. Varieties of Verbs 200
Chapter VIII. Miscellaneous Notes 205
Philological Conclusions 211

Pelotechthen Balanoides 213
ARTHUR HARVEY.

Ossianic Poetry 216
DAVID SPENCE.
The Dean of Lismore 217
The Seann Dana: Rev. John Smith, D.D. 217
James Macpherson 217
John F. Campbell and Hector McLean 220
August Ebrard 222
Subject matter of the Poems 222

Memorandum on the Movement for Reckoning Time on a Scientific Basis 227
SANDFORD FLEMING, C.E., C.M.G., LL.D.
Reckoning by Hour Meridians 228
The 24 Hour Notation 230
British Possessions 234
Foreign Countries 236
Note respecting the Hour Meridians as numbered on the Map 237
Map of the World ..... *To face* 237

Formation of Toronto Island 239
L. J. CLARK.
Drawing showing the Development of Toronto Harbor 246

Contributions to the Morphology and Physiology of the Cell 247
A. B. MACALLUM, B.A., M.B., PH. D.
I. A Cellular Parasite from the Intestinal Epithelium of Diemyctylus Viridescens 248

II. On Chromatophagous and other Intracellular Parasites in the Intestine of Necturus Lateralis 252
III. On Certain Structures in the Pancreatic Cells of Amphibia 253
Methods of Study 257
Observations 260
1. Parasites 261
2. Karyolytic and Cytolitic Products 265
3. Migrated or Extruded Plasmosomata 267
4. Zymogenesis 269
Appendix 272
Plate I ..... *To face* 275
Plate II ..... *To face* 277

List of Members 279

Exchanges 282

ROYAL CHARTER OF INCORPORATION OF "THE CANADIAN INSTITUTE," GRANTED 4TH NOVEMBER, 1851.

PROVINCE OF CANADA.—ELGIN AND KINCARDINE.

VICTORIA by the Grace of God of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith, &c. &c.

To all to whom these presents shall come, greeting.

Whereas William E. Logan, John O. Browne, Frederick F. Passmore, Kivas Tully, William Thomas, Thomas Ridout, Sandford Fleming, and others of our loving subjects in our Province of Canada, have formed themselves into a Society for the encouragement and general advancement of the Physical Sciences, the Arts and Manufactures, in this part of our Dominions; and more particularly for promoting the acquisition of those branches of Knowledge which are connected with the Professions of Surveying, Engineering, and Architecture: being the Arts of opening up the Wilderness and preparing the country for the pursuits of the Agriculturist, of adjusting with accuracy the boundaries of Properties, of improving and adorning our Cities and the habitations of our subjects, and otherwise smoothing the path of Civilization; and also being the Arts of directing the great sources of Power in Nature for the use and convenience of man, as the means of production and of traffic both for external and internal trade, and materially advancing the development of the Resources and of the Industrial Productions and Commerce of the Country; and have commenced the formation of a Museum for collections of Models and Drawings of Machines and Constructions, New Inventions and Improvements, Geological and Mineralogical Specimens, and whatever may be calculated, either as Natural Productions or Specimens of Art, to promote the purposes of Science and the general interests of society, and have subscribed and collected certain sums of money for these purposes.

And whereas, in order to secure the property of the said Society and to extend its useful operations and at the same time to give it a more permanent establishment among the Literary and Scientific Institutions of this part of our Dominions, we have been besought to grant to the said William E. Logan, John O. Browne, Frederick F. Passmore, Kivas Tully, William Thomas, Thomas Ridout, Sandford Fleming, and to

those who now are or shall hereafter become members of the said Society, our Royal Charter of Incorporation, for the purpose aforesaid.

Now know ye that we, being desirous of encouraging a design so laudable and salutary, of our especial grace, certain knowledge, and mere motion, have willed, granted and declared, and do by these presents for us, our heirs and successors, will, grant and declare that the said William E. Logan, John O. Browne, Frederick Passmore, Kivas Tully, William Thomas, Thomas Ridout, Sandford Fleming, and such others of our loving subjects as now are members of the said Society, or shall at any time hereafter become members thereof according to such regulations or by-laws as shall be hereafter framed or enacted, shall by virtue of these presents be the members of, and form one body politic and corporate for the purposes aforesaid, by the name of "The Canadian Institute," by which name they shall have perpetual succession and a common seal, with full power and authority to alter, vary, break, and renew the same at their discretion, and by the same name to sue and be sued, implead, and be impleaded, answer and be answered unto, in every court of us, our heirs and successors, and be forever capable in the law to purchase, receive, possess, and enjoy to them and their successors, any goods and chattels whatsoever, and also to be able and capable in law (notwithstanding the Statutes of Mortmain) to take, purchase, possess, hold and enjoy, to them and their successors, a Hall or House, and any Messuages, Lands, Tenements, or Hereditaments whatsoever, the yearly value of which, including the site of the said Hall, shall not exceed in the whole the sum of Two thousand pounds, computing the same respectively at the rack rent which might have been had or gotten for the same respectively at the time of the purchase or acquisition thereof, and to act in all the concerns of the said body politic and corporate for the purposes aforesaid as fully and effectually, to all intents, effects, constructions and purposes whatsoever, as any other of our liege subjects or any other body politic or corporate in our said Province of Canada, not being under any disability, might do in their respective concerns.

And we do hereby grant our especial license and authority unto all and every person and persons, bodies politic and corporate, otherwise competent, to grant, sell, alien, and convey in Mortmain unto and to the use of the said Society and their successors any Messuages, Lands, Tenements, or Hereditaments, not exceeding such annual value as aforesaid. And our will and pleasure is, and we further grant and declare, that there shall be a General Meeting of the Members of the said body politic and corporate, to be held from time to time as hereinafter mentioned, and that there shall always be a Council to direct and manage the concerns of the said body politic and corporate, and that the general

meetings of the Council shall have the entire direction and management of the same in the manner and subject to the regulations hereinafter mentioned. But our will and pleasure is, that at all General Meetings and Meetings of the Council, the majority of the members present, and having a right to vote thereat respectively, shall decide upon the matters propounded at such meetings, the person presiding therein having, in case of an equality of numbers, a second or casting vote.

And we do hereby also will, grant, and declare that the Council shall consist of a President, not more than three nor less than one Vice-President, and not more than eleven nor less than three other Members, to be elected out of the members of the said body politic and corporate, and that the first Members of the Council, exclusive of the President, shall be elected within six calendar months after the date of this our Charter, and that the said William E. Logan shall be the first President of the said body politic and corporate.

And we do hereby further will, grant and declare that it shall be lawful for the Members of the said body politic and corporate hereby established to hold General Meetings once in the year or oftener, for the purposes hereinafter mentioned—viz., that the General Meeting shall choose the President, Vice-Presidents, and other Members of the Council; that the General Meeting shall make and establish such by-laws as they shall deem to be useful and necessary for the regulation of the said body politic and corporate, for the admission of members, the establishment of Branch Societies, the management of the estate, goods, and business of the said body politic and corporate, and for fixing and determining the manner of electing the President, Vice-Presidents, and other Members of the Council, and the period of their continuance in office, as also of electing and appointing a Treasurer, two Auditors, and two Secretaries, and such other officers, attendants, and servants, as shall be deemed necessary or useful for the said body politic and corporate, and such by-laws from time to time shall or may alter, vary, or revoke, and shall or may make such new and other by-laws as they shall think most useful and expedient, so that the same be not repugnant to the laws of England, to these presents, or to the laws and statutes of this our Province of Canada, and shall and may also enter into any resolution and make any regulation respecting any of the affairs and concerns of the said body politic and corporate as shall be thought necessary and proper.

And we further will, grant and declare that the Council shall have the sole management of the income and funds of the said body politic and corporate, and also the entire management and superintendence of all the other affairs and concerns thereof, and shall and may—but not

inconsistently with or contrary to the provisions of this our Charter or any existing by-law, the laws of England, or the laws and statutes of our said Province of Canada—do all such acts and deeds as shall appear to them necessary or essential to be done for the purpose of carrying into effect the objects of the said body politic and corporate.

And we further will, grant and declare that the whole property of the said body politic and corporate shall be vested, and we do hereby vest the same, solely and absolutely in the members thereof, and that they shall have full power and authority to sell, alienate, charge or otherwise dispose of the same as they shall think proper; but that no sale, mortgage, incumbrance, or other disposition of any Messuages, Lands, Tenements, or Hereditaments belonging to the said body politic or corporate shall be made, except with the approbation and concurrence of a General Meeting.

And we lastly declare it to be our royal will and pleasure that no resolution or by-law shall on any account or pretence whatsoever be made by the said body politic and corporate in opposition to the general scope, true intent and meaning of this our Charter, the laws of England, or the laws and statutes of this our said Province of Canada, and that if any such rule or by-law shall be made, the same shall be absolutely null and void to all intents, effects, constructions and purposes whatsoever.

In testimony whereof we have caused these our Letters to be made Patent, and the Great Seal of our said Province to be hereunto affixed.

Witness our Right Trusty and Right Well-beloved Cousin James, Earl of Elgin and Kincardine, Knight of the Most Ancient and Most Noble Order of the Thistle, Governor General of British North America, and Captain General and Governor-in-Chief in and over our Provinces of Canada, Nova Scotia, New Brunswick, and the Island of Prince Edward, and Vice Admiral of the same, &c. &c., at Quebec, this fourth day of November, in the year of Our Lord One Thousand Eight Hundred and Fifty one, and in the fifteenth year of our reign.

[L. S.] W. B. RICHARDS,
Attorney General.

By Command,
E. A. MEREDITH,
Assistant Secretary.

PRESIDENTS

OF THE

CANADIAN INSTITUTE.

1849	Hon. H. H. Killaly.
1850	Charles Rankin, C.E.
1850–51	Sir W. E. Logan, C.E., F.R.S.
1851–52	" " "
1852–53	Gen. Sir J. H. Lefroy, K.C.M.G., C.B., F.R.S.
1853–54	Hon. Sir John B. Robinson.
1854–55	" " "
1855–56	Hon. G. W. Allan.
1856–57	Hon. W. H. Draper, C.B.
1857–58	" " "
1858–59	Hon. G. W. Allan.
1859–60	Sir Daniel Wilson, LL.D., F.R.S.E., F.R.S C.
1860–61	" " "
1861–62	Hon. J. H. Hagarty.
1862–63	Rev. John McCaul, LL.D.
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1864–65	Hon. Oliver Mowat.
1865–66	" " "
1866–67	Henry H. Croft, D.C.L.
1867–68	" " "
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1869–70	" " "
1870–71	Rev. Henry Scadding, D.D.
1871–72	" " "
1872–73	" " "
1873–74	" " "
1874–75	" " "
1875–76	" " "
1876–77	James Loudon, M.A.
1877–78	" " "
1878–79	Sir Daniel Wilson, LL.D., F.R.S.E., F.R.S.C.
1879–80	" " "
1880–81	" " "
1881–82	John Langton, M.A.
1882–83	John M. Buchan, M.A.
1883–84	" " "
1884–85	W. H. Ellis, M.A., M.B.
1885–86	" "
1886–87	W. H. VanderSmissen, M.A.
1887–88	" " "
1888–89	Charles Carpmael, M.A., F.R.S.C.
1889–90	" " "

OFFICERS

OF

THE CANADIAN INSTITUTE,

1889-1890.

President:
CHARLES CARPMAEL, M.A., F.R.S.C.

Vice-President:
T. B. BROWNING, M.A.

Secretary	ALAN MACDOUGALL, M. Inst. C.E., F.R.S.E.
Treasurer	JAMES BAIN, Jr., Esq.
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Librarian	A. F. CHAMBERLAIN, M.A.
Curator	DAVID BOYLE, Ph.B.

Members of Council:

W. H. ELLIS, M.A., M.B.
ALEX. MARLING, LL.B.
GEO. E. SHAW, B.A.
JAMES H. PEARCE, *Chairman of the Biological Section.*
W. E. MIDDLETON, *Secretary of the Biological Section.*
ROBERT DAWSON, *Chairman of the Architectural Section.*
W. H. MERRITT, *Chairman of the Geological and Mining Section.*
D. R. KEYS, B.A., *Chairman of the Philological Section.*

Assistant Secretary and Librarian:

R. W. YOUNG, M.A.

TRANSACTIONS

OF

THE CANADIAN INSTITUTE,

SESSION 1889-90.

SPECIAL MEETING.

At a special general meeting, duly called by circular, held on 22nd July, 1889, Mr. Vice-President T. B. Browning in the chair, the following resolution was moved by Mr. John Notman, seconded by Mr. G. E. Shaw, and carried :

"That whereas the Hon. G. W. Allan formerly conveyed to the Canadian Institute lots numbers 32 and 33 on the west side of Pembroke street, in the city of Toronto ; and whereas, by deed, bearing date the seventeenth day of July, A.D. 1871, the said Canadian Institute granted to the said Hon. G. W. Allan lot numbers 32 and the northerly fifty-two feet of lot number 33 on the west side of Pembroke street, according to Plan No. 150, registered in the Registry office for the said city ; and whereas, the said last mentioned deed was executed by the hand of the then President and Secretary of the said Canadian Institute and under the corporate seal thereof, but it does not appear from the minutes of the said Institute that the said deed and transfer was ever approved of or concurred in by a general meeting of the members thereof, and it seems desirable that the same should be concurred in and approved of ; it is resolved that this special general meeting of the members of the said Canadian Institute, duly called for that purpose, doth hereby approve of the said deed and transfer to the Hon. G. W. Allan, and doth hereby ratify and confirm the same and hereby concurs in the action of the said President and Secretary in executing the same and affixing thereto the corporate seal of the Canadian Institute."

FIRST MEETING.

First Meeting, 2nd November, 1889, the President in the chair.

The report of Mr. J. T. B. Ives, F.G.S., delegate of the Geological and Mining Section to the meeting of the American Institute of Mining Engineers at Ottawa, was read, and the thanks of the Institute tendered to him.

Donations since last meeting, 111; exchanges, 1,140; purchases, 387; total, 1,638; new exchanges, 47.

A letter from Mr. Boyle respecting the Archælogical Collection was read and referred to a Special Committee, and the Council was instructed to take measures for issuing a larger edition of the next Report.

Joseph Dilworth, A. W. Dingman and George Pattinson were elected members, and Charles Pearson, John Edmunds and L. M. Cockerell associates.

Mr. Arthur Harvey read a paper on "Pelotechthen Balanoides," and presented some specimens to the Museum.

Dr. A. M. Rosebrugh read a paper on "Prison Reform in the United States."

Mr. Marling inquired whether Dr. Rosebrugh could give any information as to the comparative increase of crime in European countries and the United States, and how the native American compares with the immigrant in regard to the commission of criminal offences.

Dr. Rosebrugh was not prepared to give any statistics in the matter.

Mr. G. M. Rae stated that in the greater offences the native American outnumbers the immigrant.

Mr. Chamberlain referred to the influence of the low state of the morals of public men in regard to politics and the extent of all the forms of mercantile dishonesty.

Mr. Macdougall thought that the system of complete isolation had been done away with years ago. He was quite surprised to hear the statements regarding the advantages resulting from the cellular system.

Dr. Rosebrugh—In the solitary system employed in Philadelphia the criminals were kept in complete isolation for three or four years. They saw no one but the keepers and the chaplain. In the same system in Belgium and England nine months were considered sufficient. After

that the criminal passed to an intermediate prison, and was finally advanced to an institution to test the reality of his reformation.

Mr. Marling—It appeared to him that the causes of crime went much farther back. In their endeavour at reformation they should commence with the moral education of the children. The question of moral training in schools was looked upon by some as a matter impossible to handle. He did not think that this was a correct view of the case. The question was occupying much attention in the United States. It should receive more attention in Canada than had been given to it. It was too much ignored in this country. Another subject that should engage the attention of humanitarians was the prisoner's family. He thought that the labour of the man should go to their support. As to the cellular system it was quite clear to him that it should be adopted. In the case of persons awaiting trial they should be kept entirely separate to prevent contamination. The cellular system was the only one that could do this, and it was necessary that it should be continued for a length of time, for if the prisoner was allowed to go back to the corridors all good effects would be effaced. It was just as necessary to isolate boys in the Reformatory. The system should also be introduced into the common gaols.

Governor Green, of the Toronto Gaol, was in favour of isolation. The system in the common gaols should be re-organized with a view to isolation, which will be a very expensive matter.

Mr. Marling asked whether anything could be done in utilizing the labour of the prisoner for the support of his family.

Governor Green said that there were many difficulties in the matter.

SECOND MEETING.

Second Meeting, 9th November, 1889, the President in the chair.

The President and Mr. J. H. Pearce were named as delegates to attend a meeting of the Prisoners' Aid Association in Toronto on the 26th inst.

A letter from Dr. Schram, of Vienna, on "Cosmic Time," was read and referred to a Special Committee.

Donations and exchanges since last meeting, 56.

Mr. William Knox was elected a member.

Mr. A. F. Hunter, B.A, read a paper on "French Relics from Village Sites of the Hurons."

Mr. Marling would like to learn the locality of the ossuaries.

Mr. Hunter had been able to give only the number of them. He would give the localities in another paper.

Mr. Boyle thought that the Institute was much indebted to Mr. Hunter for his paper. Only those engaged in that sort of work can appreciate the amount of labour that Mr. Hunter had bestowed on its preparation. The localizing of the ossuaries was of considerable importance. A map should be constructed and the localities marked on the map. He had succeeded in locating twenty-two villages. Every village has not an ossuary attached to it. There appeared to be an ossuary attached to every second village. This difference between the number of villages and ossuaries may be accounted for. Some ossuaries may have been covered in the act of ploughing; this could not happen in the case of villages, which were generally laid bare by the plough. He had no doubt that many ossuaries yet remained undiscovered. If they were all known the number would nearly correspond to that of the village sites.

THIRD MEETING.

Third Meeting, 16th November, 1889, the President in the chair.

Donations and exchanges since last meeting, 59.

On motion by Mr. Boyle, seconded by Mr. Chamberlain, it was resolved, "That it would conduce materially to the interests of science and the influence of the Canadian Institute to hold one or more meetings during the year in other cities and towns of this Province, and that a Committee of three members be appointed by the President to make enquiries for the holding of such a meeting in whatever place may be deemed most suitable and report to the Council before the close of the present session."

The President named as a Committee Messrs. Boyle, Chamberlain and Macdougall.

On motion by Mr. Chamberlain, seconded by Mr. VanderSmissen, Sir Daniel Wilson was requested to convey to the American Philosophical Society of Philadelphia the congatulations of the Canadian Institute on the celebration of its centenary.

Mr. F. S. Spence was elected a member.

Mr. Levi J. Clark read a paper on "City Sanitation and the Sewage Problem.'

Mr. Arthur Harvey had paid a good deal of attention to the subject since the reading of Mr. Clark's paper of last session. The main question was then discussed, and the opinions of some of the engineers present were favourable to the plan proposed. He could not help protesting against the waste of fertilizing matter which it involved. If the sewage of Toronto were to be turned into the lake, Mr. Clark's ingenious contrivance for utilizing the water-power of the flushing tanks to drive the sewage out to sea and prevent the choking of the great outlet pipe seemed very cheap and appeared to promise good results. But while he thought considerations of economy might compel the adoption of such a system in Toronto, he was much opposed to the great waste involved in it. Some regions in the Old World, once fertile, had become deserts through taking successive harvests from the soil and returning nothing to it. From this and other causes several New England States and parts of New York no longer yielded as they once did. In Canada, the Richelieu district, once the granary of a Province, was now an importer of food. Surely we ought to exhaust every means of saving the fertilizers in sewage before accepting a method of total waste. He had caused a close enquiry to be made in England of modern methods of sewage disposal, and had interested in the subject Mr. T. Kennard Thomson, one of the brightest graduates of the Toronto School of Science, now a member of the American Institute of Civil Engineers. This gentleman had examined the sewage farms, the filtering beds, the methods of electrolysis, the Condor method of deodorisation, the Amiens system, and had come to the conclusion (with which Mr. Harvey agreed) that if any European system was to be introduced into America it should be the system of precipitation, and that the best and cheapest precipitant was the porous carbon, charged with chemicals, now being used at Ealing, Southampton, Coventry, and other places; of which certain trials had been made at the City Hall here and at the Agricultural College in Guelph. Mr. T. Kennard Thomson had visited Southampton (shortly after the visit of the Mayor of Toronto), also Ealing and one or two other towns. The system at Southampton was self-supporting; at he other places nearly so. The precipitation was very rapid, and the solids, though not being of as much value for manure as once expected, were nevertheless all in demand. The effluent of the precipitation was colorless and bright. It contained some nitrates, and all germs were not destroyed; but if it was desirable, these nitrates could be saved and the effluent sterilised at small cost. After referring to the systems in use in other towns in England, which had worked quite satisfactorily in

destroying the sewage, Mr. Harvey said he thought that we had perhaps gone too far on a defective system of sewer construction in Toronto to change it, but younger cities and towns would do well to provide one system for dealing with rain water and a distinct one for sewage. This should be conducted to precipitating tanks in small well-glazed pipes. The volume of sewage would be constant, much less in quantity than by the mixed system, sewer gas would not be generated in such abundance, it would not circulate in the pipes or escape from them, the cost of such a system would be moderate, it would fulfil all sanitary needs, and the sewage could be cheaply and easily made useful for fertilizing purposes.

FOURTH MEETING.

Fourth Meeting, 23rd November, 1889, the President in the chair.

This meeting was devoted to the consideration of certain proposed amendments to the Regulations and By-laws.

FIFTH MEETING.

Fifth Meeting, 30th November, 1889, the President in the chair.

Donations and exchanges since last meeting, 85.

Francis Oakley, M.D., was elected a member.

Dr. Sandford Fleming read a letter from the Astronomer Royal on Cosmic Time, and submitted a memorandum he had prepared at the request of the Astronomer Royal on "The movement for reckoning time on a scientific basis, by which the greatest possible degree of simplicity, accuracy and uniformity will be obtainable in all countries throughout the world." It showed that the hour zone system, known here as standard time, has been adopted in Asia, Europe and America, that is to say in Japan, Sweden, Austria, Hungary, Great Britain, Canada, and the United States. The 24-hour notation is also making steady progress, although Canada is taking the lead. It is the only system in use at this date north of the 49th parallel and west of the 89th meridian. There is not a Province in Canada where it is not already in use. It has been adopted on the railways in Nova Scotia,

New Brunswick, Prince Edward Island, Manitoba, Assiniboia, Alberta, British Columbia, and partly in Quebec and Ontario, and so satisfactory are the results of four years' experience that there can be no doubt of its application being speedily extended. The Institute has had communication with the Grand Trunk and Canadian Pacific authorities, who are, we believe, quite ready to introduce it so soon as they are satisfied the public will assist.

He also read a translation of a communication from the distinguished Belgian, M. Houzeau, on "The History of the Hour." He pointed out that the division of the day into two series of hours goes back more than twenty centuries before our era, but the point of division being placed at mid-day is comparatively recent. Originally the first hour began at the rising of the sun ; mid-day was called six o'clock and sunset was called twelve o'clock. The progress of the day was denoted by the position of the sun, the hours of the night by the stars. The length of the hours continually changed with the seasons, and it is remarkable that when a commencement was made to use mechanical movements to measure time the population exacted the preservation of the unequal hours. As a consequence the machines were exceedingly complicated. To mark continually varying periods of duration by instruments of regular motion demanded the greatest ingenuity, but such are the exigencies of ancient habit of thought that people would not for a long period hear of compounding. The day and night, they exacted, should remain separated, and that the hours should be variable in length, according to the seasons. In Paris, so late as the beginning of this century, distinctions were awarded for mechanism that would denote the variable hours ; the hours of the day in June were more than double those of the night, and in December *vice versa.* This troublesome arrangement came to an end and clocks were allowed to go at the same rate day and night, but the commencement of reckoning continued to be placed at sunset, a custom which exists at the present day in some parts of Italy. As the moment of sunset is changing from day to day, it became necessary constantly to interfere with the most uniform clocks, moving the hands backward or forward as the seasons changed. This, too, came to an end. In 1792 London ceased to push on the hour ; the Continent was less enterprising, Berlin only renounced the daily alteration of its clocks in 1810, and Paris in 1816. There yet remains to us of primitive times the double series of hours in each divisional period, the meaning of which has long since disappeared, as there is only one species of hours. We have also the absence of system in the relationship between the hours in the different longitudes. M. Houzeau writes :—
"What then has been done is but a small matter with regard to the

value of what remains to be done. One reform demanded is the notation of the hours from 1 to 24 in place of twice twelve, a practice from which not only inconveniences result, but danger in connection with railways from the possible confusion between the hours of morning and the hours of evening. It would not be more difficult to reckon 13 o'clock for the hour which follows mid-day than to recommence a new notation. Everybody knows that 13 comes after 12. There is nothing new to learn. If only the administrators of railways have the courage to introduce the new notation in their time tables the public will follow it."

On motion of Mr. W. H. Merritt, seconded by Dr. Meredith, it was resolved, "That the memorandum now submitted be transmitted to His Excellency the Governor-General with the respectful request that means be taken to bring the subject to the notice of foreign nations and in the hope also that through His Excellency's intervention the advantages of the improvements in time-reckoning introduced with so much practical success in Canada may be extended to the British possessions round the globe.

On motion of Mr. Browning, seconded by Mr. Chamberlain, it was resolved, "That in order to meet every difficulty which may arise from the introduction of the improvements in time-reckoning, a permissive Act should be passed by the Dominion and Provincial Parliaments, and with this in view it is suggested that petitions to Parliament be signed by members of the Institute and other citizens."

SIXTH MEETING.

Sixth Meeting, 7th December, 1889, the Vice-President in the chair.

Mr. J. W. L. Forster was elected a member.

The Rev. Edward F. Wilson read a paper on the "Formation of a Society to be called The Canadian Indian Research and Aid Society." He argued that the society should be organized, because it is desirable that Indian relics, traditions, folklore, etc., be collected and preserved while yet it is possible to gather them; because the Indians are the "wards of the nation," and it is the duty of the Canadian people to take a kindly interest in their welfare; because all efforts made hitherto for the benefit of the Indians have been isolated in their character—each Church working on its own lines and the Indian Department on its line and the general public knows but little either of what the Churches or

the Government is doing; because in the States there are two or three well-organized societies having the above objects in view already successfully in operation, and in Canada there are none.

The aims and objects of the society will be to bring the cause of the Indians more prominently before the Canadian public, the Christian Churches working hand in hand together, hearing about (through the journal and meetings) and taking an interest in each other's work. Each Church can still follow its own lines in caring for its own church members among the Indians and educating their children, but it is believed that great benefit will accrue from this united effort, at which the proposed society aims, and that it will become a power for good (as have similar societies in the States) in restraining injustice and improving the condition of the Indians, and will lead to a deeper and more earnest interest in their welfare.

Any archæological specimens collected by the members of the society will be deposited with the Canadian Institute, Toronto.

The following persons have subscribed their names to become members of the Society so soon as it is set on foot, provided it is conducted on the lines and in the spirit set forth :—Sir Daniel Wilson, University of Toronto; Prof. Chas. Carpmael, Observatory, Toronto; Rev. Dr. Wm. McLaren, Knox College, Toronto; Prof. J. Galbraith, School of Practical Science; Prof. W. H. Ellis, School of Practical Science; Rev. J. D. Cayley, St. George's Rectory; Mr. David Boyle, Canadian Institute; Mr. T. B. Browning, Vice-President Canadian Institute; Rev. Dr. John Potts, Toronto; Rev. Principal George M. Grant, Queen's University, Kingston; Mr. James Bain, Jr., Chief Librarian, Public Library; Mr. Horatio Hale, Clinton, Ont.; Rev. Edward F. Wilson, Sault Ste. Marie, Ont.; Mr. C. H. Hirschfelder, American Vice-Consul, Toronto.

A monthly journal or periodical will be published under the auspices of the Society; the journal to give general information of missions and educational work among the Indians (irrespective of denomination), and also to have papers of an ethnological, philological and archæological character.

Ojijatekhah thought that branches of the proposed society should be established among the Indians. It would tend to bring out individuality. Among the Six Nations there were many able men, but there was no way of developing their abilities. He fully endorsed Mr. Wilson's views.

Mr. Browning enquired how the Municipal Act worked among the Indians.

Ojijatekhah.—In some places it worked very well. He thought there were some good points in it. It was working well among the Mississaguas. Some of the older people were opposed to it.

Mr. Chamberlain thought, on account of the national character of the society much could be done in regard to science that could not be done by the Canadian Institute nor by the Government. By means of this scheme they would come into direct contact with the Indians. Another point in its favour was the broad platform on which it was founded.

From these considerations he thought the Institute should give it its support.

Mr. Harvey, while he considered the scheme very good in its general aim, thought the details were very faulty. He thought that science and religion were too much mixed up in it. He thought it was necessary to consult the Indians themselves. He spoke favorably of the work done at the Shingwauk Home. He had come across some Indians from that institution. They were fine bright lads, who were quite able to take their places alongside the white children.

SEVENTH MEETING.

Seventh Meeting, 14th December, 1889, the President in the chair.

Donations and exchanges since last meeting, 95.

Rev. E. F. Wilson, G. K. Powell and R. Haslitt were elected members.

A letter was read from Dr. A. M. Rosebrugh announcing that the question of priority of invention of a system of duplexing metallic telephone trunk lines had been decided by the United States Patent Office in his favor ; also a letter from Professor Schram of Vienna, with papers, giving an account of the steps taken to introduce the hour-zone system of time-reckoning on the German and Hungarian railways.

On motion of Mr. Marling, seconded by Mr. Merritt, it was resolved, "That petitions to the House of Commons, the Senate and the Governor-General relating to the introduction and adoption of Standard Time be sent to Hamilton, Ottawa and Kingston for signature ; that those for Ottawa and Kingston be sent to Dr. Fleming, and those for Hamilton to the Hamilton Association with the request that they take charge of the petition and endeavor to obtain signatures.

Mr. Arthur Harvey read a paper on "The Cruel Plant (*Physianthus albens*)," ilustrated by specimens.

In answer to a question from Mr. Hamilton, Mr. Armstrong said that the humming birds and insects would not feed on the insects caught. The humming bird feeds on honey. He, therefore, thought that the humming bird was the agent in cross-fertilization. The larger sphinx moths may also act as fertilizers. He had seen a moth with the pollen adhering to it, and so carried away to another plant. He was sure that the cruel plant did not make use of the insects caught. He had found as many as sixty-five moths in one species of the plant. He understood that the common milk-weed also acts as a fly-trap He wished some of the junior members would collect specimens and endeavour to ascertain the fact.

Mr. J. B. Williams read a paper on "Birds recently added to the Museum." He exhibited between thirty and forty mounted specimens which had been added during the past year to the Institute Museum. The following species, all taken in the neighbourhood of Toronto, were represented :—Winter wren, house wren, cat bird, chestnut-sided warbler, myrtle warbler, cedar waxwing, scarlet tanager, indigo bunting, fox sparrow, song sparrow, pine siskin, redpoll, red-winged blackbird, cow-bird, horned lark, yellow-bellied flycatcher, olive-sided flycatcher, crested flycatcher, red-headed woodpecker, belted kingfisher, black-billed cuckoo, yellow-billed cuckoo, rough-legged hawk, red-backed sandpiper. stilt sandpiper, Caspian tern, and Bonaparte's gull. The habits and distribution of these different birds were described, and two mounted groups to illustrate the natural habits and surroundings of our Canadian birds were also exhibited, one of the wood pewee, with its nest and eggs, which was procured by the members of the biological section on the occasion of their excursion last June to Scarboro' Heights ; the other of the least bittern, with nest and eggs surrounded by grasses and reeds, upon one of which is perched a specimen of the long-billed marsh-wren. These were taken last summer in Ashbridge Bay. Mr. Williams expressed a hope that sufficient funds would be provided to procure a number of such groups for the museum, so that it would become an interesting and instructive institution, not only to scientific men, but to the public generally. A specimen of the razor-billed auk, recently taken in Toronto Bay, and kindly lent for the evening by Mr. Cross, the taxidermist, on Yonge street, was also exhibited. This is the first record of the bird having been taken on Lake Ontario, and it was hoped this specimen would be secured for the museum, and not be lost in some private collection, as is the case with many of the rare birds taken in this neighborhood.

Mr. Stark enquired respecting the sparrows whether they drove away any insectivorous birds.

Mr. Williams did not think that they were so bad as the American Report tried to make them out. He did not think they had exterminated any birds.

Mr. Harvey called attention to the persistency with which some birds frequented the same locality. He had noticed a wren that came to the same place for five years in succession. The same bluebirds came three years, and the same cat-birds three or four years successively. He had a fly-catcher about his place for four or five years.

EIGHTH MEETING.

Eighth Meeting, 21st December, 1889, the President in the chair.

Donations and exchanges since last meeting, 37.

Mr. T. B. Browning read a paper on "The Codification of the Law."

The paper opened with an account of codification in India, and the progress of the movement generally. He regarded the term "code" and the qualities usually ascribed to it as relative rather than absolute. That code is best which is most complete, most precise, most systematic. The laws which pass under Justinian's name would not be called a code in any modern meaning of the word. There are states of law as growing custom, which scarcely admitted of codification, but the general mass of our procedure and substantive law was in a fit condition for and urgently demanded codification, while the most effective means of codifying was by taking the law in sections, as was done in India. Case, statute, and text-book law was reviewed, and the approximate result of codification upon each pointed out. Case law showed itself in three stages, historically speaking:—As voluntary reporting by judges and counsel in the olden time; speculative, where publishers engaged in it for profit; authoritative, under direction of legal authorities. Mr. Browning was of opinion that all cases in the Superior Courts should be officially reported, and not some only as now, and gave as his reason that each judgment not only determines the law for a particular group of facts, but with us constitutes a rule to be followed in subsequent similar groups; is as much a part of the law as a statutory provision, and the means of ascertaining that law should be given. The only remedy for the

excessive bulk of the reports was codification, which meant the summing up of past law, and gave a new start to case law. Speaking of statutes, he divided them into the ante-reform period, where they constituted isolated interferences by the legislature with the established course of justice. The post-reform period took a much wider range, and developed what is known as the consolidation system, which was applied mainly to company and land law, to crimes and procedure. Mr. Browning criticised the cumbrous form of statutes, their want of definition, redundancies in words, inaptness of division, want of thoroughness and temporary character, but saw in consolidation a step to codification, and in the late Judicature Act, the fullest consolidation we have, almost a realization of it. Especial value was placed on text books, which were ranked in three classes: First, those writers before Coke, who sum up, or are supposed to sum up the early customary law of England, but whose authority is now waning, as one of the results of recent investigation. Second, writers from Hale to to-day. These enumerate, analyse and extract general rules from cases and statutes; but of late years are becoming so unwieldy from mass of matter as almost to defeat their end—an exposition of the law. In the third class are found Mr. Justice Stephen, Sir Frederick Pollock, and others. They give special prominence to principles and cite cases, not by way of discussion, but as examples or foundations for principles, in a short, clear, mathematical form. From this stage of legal development to codification the distance is not far; the very form they use is taken from Macaulay's penal code for India. Mr. Browning then showed the principles on which the Anglo-Indian codifiers proceeded, and illustrated his remarks by extracts from their work. Except English-speaking peoples, all civilized nations have codified their laws and find the system useful. England has used a code of bills, notes, and cheques with acceptance since 1882, which our commercial men might find it to their profit to introduce into Canada. Summing up, Mr. Browning claimed for a competent codification the following advantages:—1. The summing up of case and statute law in distinct propositions with due limitations—reducing the law to definiteness. 2. A consequent gain in intelligibility, an enormous saving in labour and cost to the community.

NINTH MEETING.

Ninth meeting, 11th January, 1890, Dr. Kennedy in the chair.

Donations and exchanges since last meeting, 125.

The President, the Secretary, Hon. G. W. Allan, Professors Ellis and Pyke, Dr. Kennedy, and Messrs. Marling and Merritt were named a committee to co-operate with the other Societies in the movement to retain Upper Canada College and grounds for museums and other purposes.

Announcement was made of the death of Samuel Keefer, C.E., a member of the Institute since 1850.

Mr. Charles G. Y. King, late Superintendent of the Haitian Navy, read a paper on "Personal Experiences in Haiti under President Legitime." He dealt with the political and domestic life of this black Republic, the general appearance of the island as viewed from various points and harbours, and described as truly picturesque the lofty mountainous regions attaining an altitude of over 8,000 feet above the sea level, and the luxuriant, fertile plains of the Artibouill and other valleys. Many graphic and humourous sketches of the habits, costumes, and customs of the people were vigorously represented, and many thrilling incidents of naval and military life during the late rebellion added zest to the evening's amusement. Various examples of creole conversation and native proverbs, descriptions of floral, agricultural and forest scenes occurred at frequent intervals. Mention of voudou rites and ceremonies and native superstitions gave an insight into the inner life of this strange people.

TENTH MEETING.

Tenth meeting, 18th January, 1890, the Vice-President in the chair.

Donations and exchanges since last meeting, 81.

Mr. Boyle announced a loan to the Institute by Mr. Long of some hundreds of archæological relics found in the neighbourhood of Toronto.

John McConnell, M.D., was elected a member.

W. A. Douglass, B.A., read a paper on "The Distribution of Wealth as Related to Production." The Creator furnishes the raw material with the

physical force: man wants the finished article. To obtain this finished article toil must be expended. Nature is a coy maiden, and will be wooed only by the hand of industry. Idleness she abhors as she abhors a vacuum, and the idler she punishes with weeds, poverty and death. Man's tenure on this planet depends on his industry; nature knows no compromise: her decree is short, sharp and decisive toil or death. The first of nature's laws is: Produce to the producer only.

The productive power of man is limited: for any man or any number of men to produce sufficient to maintain the succeeding generation without toil is a physical impossibility. Human skill can be perpetuated only by continuous practice. Hence nature has so limited production that the exercise of toil is an indispensable necessity. Nature's second law is limited production.

All human productions are transitory. The food of this year is soon consumed, our machines quickly wear out, even our buildings, stable as they seem, do not last on the average more than one generation. Nature's third law is transition of product.

These laws summarized are: produce to the producer only, produce limited, produce transitory.

If, therefore, our statutory law of distributing wealth conformed to nature's laws, we would have for each individual produce only when he produced. In nature's laws we find no continuous income without toil and much less do we find an increasing income without toil.

How far we have departed from nature's laws of distribution by our legislative enactments may be readily seen in the fact that many obtain large production without producing, many continue to enjoy large product generation after generation without producing, and many enjoy increased production without producing. Our legislative methods of distribution are utterly at variance with nature's laws of distribution.

How this comes about may at once be seen by noting two fatal errors in our legislative enactments:—1st—Treating raw material, the land, the ore, the water-power, nature's gifts, as though they were the products of labour. 2nd—Treating the values that arise, principally to land simply from the increased demand of a larger population, as though these values were also products of labour.

The raw material or the natural opportunities are undoubtedly not the product of toil, and to say that the values that have come to the mines and lands of this continent with its growing population is to set at defiance the commonest observation. It is from the non-recognition of

these two great facts that arises the contrast between nature's laws of distribution and human laws.

As the raw material is not a product, so no set of men can rightly claim it as theirs. Equity demands that the rights of all mankind to the natural opportunities are equal. If a man utilizes this right, and puts forth industry, he secures an exclusive right to the product; but if he exerts no industry, by what right can he claim product? For one portion of society to claim exclusive right to the raw material is equivalent to that portion asserting the exclusive possession of the planet.

Every growth of population is accompanied with two conditions, increased land value and increased common expenditure. The increased land value must be surrendered by the toilers. Our legal enactments determine the destination of that surrender in one of two ways, 1st, either to speculators, who appropriate without producing and thus despoil the toiler; or, 2nd, into the public treasury for the common advantage of all. Only when we have conformed to this simple law of securing to the individual the value he produces and to the community the value it produces can our laws of distribution conform to nature's laws. Nature's laws are harmonious and beneficent, and so long as we set them utterly at defiance social harmony is impossible.

Mr. Pursey thought that Mr. Douglass had placed the subject in a very clear light; there may be flaws in the reasoning, but he did not see where they were. He thought that from the importance of the subject, the meeting should have been attended by some of the professors of the science, who would point out the errors and enlighten the audience.

Mr. Richardson referred to the large amount of wealth that was annually lost through ignorance and unscientific methods of production; as in agricultural pursuits when the land was impaired by constantly growing the same crop. This was not the natural condition. If there was a proper rotation of crops there would be a constantly increasing amount of production.

Mr. Jones thought the subject was of importance in its bearing on the single tax question. He read an extract shewing that the theory of Malthus was wrong and that population will not outrun the means of subsistence.

Mr. Chamberlain: A good deal had been said against the law propounded by Malthus; in the first place he did not see what the law of Malthus had to do with the subject; and then as to Malthus himself, it was not quite clear that he understood his own principles.

Mr. Richardson: Where Malthus was not quite right was that he did not take all the circumstances of modern civilization into consideration.

Mr. Elvins was of opinion that the theory of Malthus had nothing to do with the present paper.

Mr. Boyle referred to a writer in England, who gave illustrations of the effects of increased population. The correct explanation was that given by John Stuart Mill, who when asked what was the greatest incumbrance on the land, said it was the landlord. He shewed that while the proprietor was getting more, the laborer was getting less. With every increase of population the ground rents keep advancing.

Mr. Douglass referred to some important tables got out by Mr. Giffard which showed the result was in the course of a century that there was a smaller proportion of large fortunes, and a larger proportion of small fortunes. This related to England. Every man that looks into the matter will find that the lots become divided into smaller portions. He did not find that those who held the largest portions made more of them. As to the contrast referred to between nature and man, he thought that there was no opposition between them. He considered man the most important part of nature. He asked where did they get natural distribution? We had no such thing handed down to us. It was a state that had not existed. As to the theory of Malthus, he did not think that anybody held to it in its present state.

Mr. L. J. Clark said there seemed to be a want of definiteness in the subject to satisfy his mind. He thought that there were many obscure points about it. How would the single tax affect those portions of the country that were of less value? Would there be some correcting influence attending the tax? He did not see any objection to men like Vanderbilt accumulating wealth. He thought as distributors of wealth they were an acquisition to the country.

ELEVENTH MEETING.

Eleventh Meeting, 25th January, 1890, Mr. Merritt in the chair.

Donations and Exchanges since last meeting, 50.

Mr. A. E. Rundle was elected a member.

Mr. A. F. Chamberlain, M.A., read a paper on "The Indians of Canada."

He began by indicating the progress that has been made of late years in the study of the American aborigines, noting the problems that had already been solved, and those, and there were many, which yet waited for a solution. The tendency of American investigation at the present day is to study the aborigines as Americans, or, as Mr. Henshaw has well put it, "to find out what they are" before seeking to discover "who they are," to find out how long they have been on this American continent before trying to determine from what part of the world they migrated hither. There was also a distinct trend of opinion in favor of the great antiquity of savage man in America. The writer pointed out in what relation the study of the aborigines of Canada stood to these great questions, what had been done in investigation in the past and what yet remained to be done in the future. He also dealt with race classification, showing how impossible it was to catalogue races of men by the color of their skin, their hair, or the formation of their skulls. A study of these peculiarities amongst the Indians of Canada was sufficient to reject all of them for the present at least, as absolute race classifiers. He noticed the opinion of Major Powell, that a classification of mankind into groups had resulted everywhere in failure, and inclined strongly to the view advocated by the venerable philologist Horatio Hale, shared also by Freeman, the historian, and seemingly, too, by Prof. Max Muller, that in our day language is the only certain test of race. He proceeded to discuss the linguistic families of Canada, the Eskimo, the Algonkian, the Iroquoian, the Siouan, the Athapaskan, the Salish, etc., pointing out their importance in the study of American comparative philology, and noting the results of the recent investigations of Rink, Murdoch, Petitot, Cuoq, Legoff, Dorsey, Henshaw, Hewitt, Boas, Hale, and others. He pointed out that Canada was a remarkably fertile field for ethnographical research, for within its borders lay the primitive habitats of the Eskimo, Iroquoian, and Algonkian races, according to the opinions of eminent scholars. The question of the relation of the Canadian aborigines to those of the United States was pointed out as being of very great importance, as was also the connection that must have existed in the past between the Indians proper and the Eskimo. The subject of the religion of the Indians of Canada was then taken up, and the opinion of Col. Mallory cited and agreed with that apart from ideas imparted to them by the whites, the American Indians never had any knowledge of a sole beneficent being, had no idea of monotheism as we now understand it. Myths of origin were then considered and curious beliefs cited, such as those of the Iroquois, who believed their forefathers came out of a little eminence near Oswego Falls; of the Blackfeet, who thought that their ancestors came out of two lakes in their country—men out of one,

women out of the other; of the Eskimo, who thought that their forefathers were seals, tired of the sea, who began a new life on the land Myths of migration were also discussed, and the importance of recording at once all that can possibly be obtained of the myths, legends, and folklore of the Canadian Indians was dwelt upon. The sociology, customs, and habits of the Indians were becoming more and more a subject of research, and in Canada valuable results in this field had already been obtained, and much more was to be expected in the very near future. The writer concluded by emphasizing the importance of the study of the American Indians for the proper understanding of the evolution of modern civilization and modern social and political institutions, and by expressing the hope that both the Provincial and the Dominion Government would in the future aid in carrying out these needed researches much more than they have done in the past.

Mr. Boyle said the time had gone by when students of archæology would endeavour to trace any connection between the Indians of North America and the Israelites and any other Asiatic nations. It had also gone by when America was considered the younger continent. He considered philology was the key that would unlock the difficulty of the origin of the Indian people. He corroborated what Mr. Chamberlain had said respecting the origin of Indian myths. It was impossible to give anything as a pure myth. He urged the importance of collecting all these myths. Mr. Boyle then referred to the loan of specimens to the museum by Mr. Lowry; they were peculiarly valuable as having been found within a radius of a few miles of Toronto. Another young man who had heard of what Mr. Lowry had done, declared his intention of doing the same.

Mr. Harvey, in reference to the mounds, said there was no evidence whatever as to their origin. He understood that the connection of the mound builders with Asia was now under consideration by members of the order of Jesuits in all parts of the world. At present there was nothing known with certainty. He had recently found a short statement in *Les Relations des Jesuites* that speaks of Lake Superior as the rendezvous to make their trade. This was corroborated by specimens of shells now in the museum. With respect to the myths, he suggested to Mr. Chamberlain that it would be well for him to obtain an introduction to the Seminary at Quebec, and obtain access to the documents of the early Jesuit relations. The earliest of these were very difficult of access, and still remained in manuscript.

Mr. Chamberlain had intentionally omitted to use the word "mound-builders," because it is generally agreed that there was no such people as

the mound-builders. He referred to them as the people that built the mounds.

TWELFTH MEETING.

Twelfth Meeting, 1st February, 1890, the President in the chair.

Donations and Exchanges since last meeting, 74,

William Burton, W. D. McPherson, and R. H. Ahn were elected members.

Mr. J. C. Hamilton, L.L.B., read a paper on "The Maroons of Jamaica and Nova Scotia."

THIRTEENTH MEETING.

Thirteenth Meeting, 8th February, 1890, the President in the chair.

Donations and Exchanges since last meeting, 85.

The Council reported the election of John Jackson as an Associate.

Prof. J. M. Baldwin was elected a member.

On motion by Mr. Harvey, seconded by Mr. Boyle, it was resolved, That a meeting of the members of the Institute favorable to the formation of a Historical Section, be held in the Lecture Room of the Institute on this day se'nnight at 19.30 o'clock, for the purpose of adopting a constitution and electing the officers of the said section.

Mr. J. F. Cummings, Electrical Engineer, read a paper on "The Edison System of Electric Light."

FOURTEENTH MEETING.

Fourteenth Meeting, 15th February, 1890, the President in the chair.

Donations and Exchanges since last meeting, 52.

A communication from Mr. G. M. Rae, relating to the destruction of archæological relics was referred to the Council.

Moved by Mr. Hamilton, seconded by Mr. Browning, "That the members of the Institute express profound regret at the recent calamity which has befallen the Province, in the destruction by fire of a large part of the University building, with its valuable library, apparatus and specimens. They also express the hope that the building will be speedily rebuilt, which they urge in the best interests of education and of the the people generally.

Moved by Mr. Harvey, seconded by Mr. Boyle:

"That deeply sympathizing with the Faculty and the Students in the impairment of the facilities for study, the Canadian Institute beg to tender the use of their Lecture rooms and the mineralogical and archæological museums in the building of the Institute on Richmond street. The reading room, open daily between one and six, is also placed at their service."

Both motions were carried.

Messrs. Bain and Macdougall were elected representatives of the Institute on the Board of the Industrial Exhibition Association.

Mr. Andrew Elvins read a paper on "Sun Spots during 1889," illustrated by diagrams and a magic lantern.

He stated that he at first intended to give a few facts in relation to sun spots during 1889, but finding no other paper on the programme for the evening he would branch out a little and embody the spots of 1889 in some general remarks on sun spots. He then described a typical spot and showed a drawing of one taken during the past year, also a group of spots as seen at different dates during August last. The group underwent marked changes from day to day. He alluded to the fact that spots are usually found near the sun's equator, and very rarely more than 35° from it, so the zone of spots passes around the sun parallel to the equator.

The fact that spots are more numerous some years than others was then referred to, and it was shown that though there is a cycle of about 11¾ years the real period is very variable. During 1889 there were very few spots. They have kept decreasing in numbers and size, and it is questionable if the minimum is yet reached. During 1887 there were 156 new spots, in 1888, 82 new ones, and last year only 55.

He noticed that a spot cycle commences with the spots far from the equator, and that they approach the equator at the time of sun-spot minimum or the end of the cycle. This was illustrated by diagrams. During the past year an old question has been revived. Rev. Mr.

Howlett states that though he has been observing and drawing spots for more than twenty years, he has not seen the spots show evidence of being cavities. Mr. Raynard, F.R.A.S., corroborates this statement, and Mr. Elvins' own observation leads him to the conclusion that the spots may not be cavities after all. He spoke of the spectra of spots as observed by Mr. A. F. Miller. of Toronto, and one observed at Stonyhurst, England, which gave a spectrum of bright calcium lines. He stated that two theories existed as to the nature of these spots. One regarded spots as openings in the photosphere, the other as existing on its surface and in the sun's atmosphere above the photosphere. In relation to the first he read long extracts from the recent work of J. H. Kedzie. He eulogized the work, and stated that if the meteoric theory which he had always supported, should fail (which he did not anticipate), Kedzie's explanation is the best he knows of to fall back on. At the conclusion many views were shown with the lantern by Mr. Howells and explained.

Mr. Harvey enquired whether any magnetic disturbance had been observed in connection with the sun-spots of last year.

The President had not been able to trace any connection. There was an intimate connection between magnetic disturbance and the aurora. Whenever there was magnetic disturbance there was an aurora, and *vice versa*. He referred to a large spot to which his attention had been called by his brother in England. On observing it with the spectroscope he saw bright flames in the neighborhood of the spot. Mr. Lockyer published a similar observation on the same date.

Mr. Ridout corroborated the statement of the President regarding the connection between the aurora and magnetic disturbance from his observations in the North-West.

FIFTEENTH MEETING.

Fifteenth Meeting, 22nd February, 1890, the President in the chair.

Donations and Exchanges since last meeting, 39.

A communication from the Deputy Superintendent General of Indian affairs, declining to recommend a grant by the Dominion Government to the Institute in aid of archæological research, was referred to the Historical Section.

The Secretary and Librarian were instructed to offer to the University of Toronto the use of such works in General and Classical Literature,

Philosophy and History, as are now in the Institute Library, except copies of original documents of which the Institute has no duplicates.

Mr. John G. Ridout was elected a member.

Mr. W. A. Sherwood read a paper on "Color in Nature" (a sequel to a former paper.)

Mr. Sherwood, after referring to the different views advanced by eminent men of science, their disagreement as to the cause of color perception, and to what constituted the primary colors, advanced his theory of color-blindness. That there are certain rods or cones in the retina for the perception of certain colors was now fairly established. The most recent writer on the rod or cone theory, Professor Le Conte, of the University of California, in a work on sight, afforded a great deal of light on the subject. Le Conte was supported in his views on the cone theory by the eminent Professor Herring, of Vienna. According to Herring, there are four rods or cones corresponding to the four colours—red, green, blue, and yellow—acting in pairs, yet distinct the one from the other. Color-blindness was a retinal defect, and those affected were unable to perceive red and green. These colors to the color-blind, seemed as shades of grey. This defect Mr. Sherwood declared, was due to the condition of society. For the last two centuries the color red was almost unused. With it went, by decree of certain creeds, other colors associated with it, substituting the uninteresting colors grey, black, and white. Was it not reasonable to believe that the cone, or rod, whose special function was the perception of red, would, by the absence of red, become first inactive, then dormant, and finally die? Writers on color-blindness had ascribed every cause save that which seemed most natural. He believed it was due to external and not internal causes. The sect known as the Quakers were not only found with much weakness of the eyes, but also with a large per centage of color-blindness. This Mr. Sherwood believed was due to the habit of wearing the sober colors. The primary red with them had long been in disuse, as it was now with us. With the Highlander the love of color in all varieties of hues never lessened in interest even in ripe years. With us, unfortunately, the opposite state of things existed, colour having but little interest beyond middle life. This want of interest was due to the absence of color in our daily surroundings An early return to the colors as we saw them in nature should be made The colors of autumn foliage might well replace those now used in drapery in our homes and in our literature. This would prevent an invasion in after generations of this dangerous affliction. Of the unpleasant effect of black and white, Mr. Sherwood said halls of learning often

seemed to him like white sepulchres with dark spirits hovering round. Here he would strongly reform the present custom. The professors should wear purple or terra-cotta coloured gowns, and the students baize green. The eyes of the professor would rest with pleasure upon the field of color before him, and the student would easily discern the robes of the professor, The walls should be painted with such colors as would lend a soft effect to the eye, and afford an illustration of the most prevailing tints of nature.

In reference to Mr. Sherwood's remarks as to the prevalence of color-blindness in Philadelphia, Mr. Williams thought it impossible that it was owing to the dress of the people or the color of the houses. There was no lack of red in the exterior of the houses of Philadelphia, as they were of red brick. There may be something in the interior of the houses to produce the effect.

Mr. Sherwood referred to the large quantity of marble used in the buildings of Philadelphia. He was struck with the prevalence of white. All the old buildings were white, many of the new buildings red. Color was almost unknown in the streets. Over one out of five of the inhabitants were compelled to wear glasses. It could not be accounted for on any other theory than that of the absence of red. The cure was to return to the draperies of the 16th century. Two centuries ago everyone wore red.

Mr. Harvey thought the theory was original. Some of the arguments, however, were not conclusive. As to race he thought that different races recognized different colors ; the pure blue of one race was not the pure blue of another.

Mr. Chamberlain agreed with Dr. Ryerson, who read a paper last session, that the use of tobacco and intoxicating liquors was to a great extent the cause of color-blindness. He could not draw the conclusion that savage people could distinguish colors better than civilized, as in the vocables of some Indian tribes the words for blue and green were the same. He would like to know whether any experiment had been made as to color-blindness among the lower animals.

Mr. Sherwood referred to the work of the Indians, as shewing a nice discrimination of the colors. In the basket work and bead work there was a perfect arrangement of colors. All the different colors were most accurately blended. Various incidents showed that the lower animals had a keen perception of color. As to the effect of the use of tobacco and intoxicating liquors, some of the most eminent artists who used them excessively, produced the finest works. He instanced Moreland and Turner,

whose colored pictures were celebrated all the world over. That the whole system becomes weakened by the use of tobacco and liquor, no one could deny, but it could not be proved that it was the cause of color-blindness or affected the sense of color.

Mr. Jones thought that it was carrying the thing too far to apply it to dress. He asked why Mr. Sherwood had not the courage of his convictions and come in the colored costume he advocated. He agreed with Mr. Sherwood that there was too much white in the interior of houses.

Mr. Clark wished to call attention to the investigation Dr. Ryerson had made last year as to the prevalence of color-blindness in the Public Schools. The report stated that from five to six per cent. of the pupils were color-blind. He was struck with the fact that so few of the girls were color-blind.

Mr. Sherwood thought that it was owing to the fact that girls were more accustomed to pay attention to colors.

The President enquired whether in Toronto there were more girls or boys that wore glasses.

Mr. Clark said that so far as his observations went the numbers were about equal.

Mr. Bengough stated that it was not long since a commission had been appointed to investigate the prevalence of color-blindness among the seamen employed on the lakes. One of the members of the commission told him he was surprised at the number of captains and mates of vessels that were color-blind. The men were astounded to find that so many had to be set aside for that defect.

SIXTEENTH MEETING.

Sixteenth Meeting, 1st March, 1890, the President in the chair.

Donations and Exchanges since last meeting, 62.

Dr. P. H. Bryce read a paper on "Some Points in the Natural History of Drinking Waters."

Mr. J. J. Mackenzie, B.A., exhibited some cultures of bacteria from city water.

SEVENTEENTH MEETING.

Seventeenth Meeting, 8th March, 1890, the President in the chair.

Donations and Exchanges since last meeting, 59.

Messrs. R. Dewar and F. W. Barrett were elected members.

Mr. Ernest E. Thompson read a paper on "Canadian Faunal Lists."

Mr. Harvey referred to the unusual irruption this year of both kinds of Grosbeaks. He had never heard of the Yellow Grosbeak coming here before.

Mr. Thompson said this was the first year it had been known in New England. They were never found before in such numbers. They had been found in former years. The best known record is that of Mr. Collins, of Woodstock, in 1854. It was impossible to explain what brought them here in such numbers, unless, as Dr. Brodie had explained it, it was the effect of the frost in the branches of the trees containing the fruit which were broken off and covered with snow. This caused them to seek out other regions. Birds seem to go where they will get food ; the climate is not of so much consideration. The question of food during the winter season is the principal if not the only reason of their migration.

Mr. Harvey referred to the Baltimore Oriole being found during the summer in the neighborhood of Pelee Island. The summer there was about the same as that of Memphis. The migration of birds to that peninsula from the south-west was very remarkable. It was wonderful to see the immense number in the County of Essex, making the woods brilliant with their plumage. The Baltimore Oriole was common near Toronto, but not so much so as formerly. Speaking of migration, it was still an obscure subject. It was clear that birds did not follow some blind instinct, but were guided by certain circumstances. Some explained it as arising from a traditionary instinct derived from their ancestors.

EIGHTEENTH MEETING.

Eighteenth Meeting, 15th March 1890, the President in the chair.

Donations and Exchanges since last meeting, 45.

Prof. Ellis was elected Delegate to the next meeting of The Royal Society of Canada.

Messrs Harvey and Middleton were named Auditors for the current year.

Mr. Alderman Maughan was elected a member.

A sale of last year's periodicals was then held.

NINETEENTH MEETING.

Nineteenth Meeting, 22nd March, 1890, the President in the chair.

Donations and Exchanges since last meeting, 53.

Mr. Macdougall was named to represent the Institute on the Committee of the Parks and Public Places Association.

R. W. Doan was elected a member.

Dr. G. Sterling Ryerson read a paper on "Defective Vision in the Public Schools."

He said that during the past year 5,253 children in the Public schools have been examined, with the assistance of Dr. Wishart, as regards defective vision. Of these 2,726 were boys, and 2,527 were girls; 193 boys and 260 girls were found to be undersighted, an average of 8·6 per cent.; 78 boys and 138 girls were short-sighted, an average of 4·0 per cent. Of the 5,253 children tested, 668 were found to have visual defect of some kind, an average of 12·7 per cent. The per centage of defect varied in different schools, the smallest per centage being found in Queen Victoria School, Parkdale—4 per cent. of undersight and 6 per cent. of short sight; whereas the highest was found in the Elizabeth Street School—25·4 per cent. of undersight and 31·0 per cent. of short-sight. The per centage of Upper Canada College was 4·1 per cent. undersighted and 7·3 per cent. short-sighted. In Wellesley, 7·7 per cent. undersighted and 10·3 per cent. short-sighted. Taking the classes from senior first to senior fifth, the short-sighted increased from 2·5 per cent. to 8·6 per cent. He held that the great difference in per centages of short sight in different schools, was caused by imperfect window space, wrong position of desks, the use of ground glass in windows, the size of the playground, height of surrounding buildings, and last but not least, the home surroundings of the children. He considered that Queen Victoria school was the best lighted and ventilated he had visited, as were also the surroundings the best—a wide view over the lake, plenty of play room, and the absence of surrounding high buildings. Dr. Ryerson especially con-

demned the desks used by the junior classes as hurtful to the eyes and spine. With these exceptions, he believed the hygienic surroundings of the children to be exceptionally good, and pointed to the very low per centage of short sight, only 4 per cent., in proof of his contention. He thought that the School Board was to be congratulated, and that small as was the proportion of defect it might still further be diminished by abolishing the ground glass windows, the desk-seats of the junior classes, and the exercise of more care in placing the desks with regard to light. The proportion of defect found in Philadelphia in a similar examination was 4·27 per cent. In Germany it varied from 10·9 to 80 per cent. Two thousand seven hundred and twenty-six boys were examined for color-blindness; 84 were found more or less color-blind—about 3 per cent. Of 1,671 girls, 11 were color-blind—about 8·6 per cent. In two schools over 5 per cent. of color-blindness was found—in one as low as 1·6 per cent.

Mr. Macdougall called attention to the abominably printed school books. He thought they had as much to do with causing a strain on the children's eyes as anything. He referred to the large per centage of myopia in Lansdowne and Elizabeth street schools. He thought that the dwellings of the children would likely have an effect in producing it.

Mr. Clark had been always opposed to the use of ground glass. Clear glass could be put in much cheaper. As to the large per centage of myopia in Elizabeth Street School and Queen Victoria School, he wished some further information as to the cause. He did not think that the print of the school books was nearly so bad as that of the daily papers.

Mr. Browning wished to ask whether any relation was found between myopia and color-blindness.

The President was struck with the fact in the statistics that when the per centage of short-sightedness was large that of long-sightedness was also large.

Mr. Chamberlain referred to the remarkable contrast between the Indians of the settlements and those in the reservations in regard to long-sightedness.

Mr. Macdougall asked, in reference to the large per centage of short-sightedness in Norway and Sweden, 66 per cent., was it not owing to the glare of the snow?

Dr. Ryerson: As to the connection between short-sightedness and color-blindness, he had not found any cases where they coincided. The long-sightedness of the Indians and also of the inhabitants of Switzer-

land was very remarkable. As to the schools—The Elizabeth Street School was very badly lighted, the desks, too, were placed in a disadvantageous position. The large per centage of short-sightedness may also in a measure be due to the character of the dwellings of the children. As to Queen Victoria School, he had never examined any school where the hygienic arrangements were so good, the surroundings, also, were remarkably good, so were those of the Lansdowne School. Perhaps more credit was due to the surroundings than to the schools themselves.

TWENTIETH MEETING.

Twentieth Meeting, 29th March, 1890, Mr. VanderSmissen in the chair.

Donations and Exchanges since last meeting, 62.

A communication was read from the Chairman and Secretary of the Architectural Section, stating that at the last meeting of that Section its members had resolved for their future success and progress, it would be to their advantage to form the Section into an independent Sketching Club, which rendered it necessary to resign their connection with the Institute.

Mr. David Spence read a paper on "Ossianic Poetry."

The paper gave an account of the many collections made in the Highlands at different times of Gaelic poems, ballads, and tales; with brief sketches of the works of such eminent collectors of fragments of ancient Celtic literature, as McGregor, Dean of Lismore; Rev. Dr. John Smith, and others. It then proceeded to deal more in detail with the collections made by James Macpherson and by John F. Campbell, of Islay. The progress of the Ossianic controversy was traced, and a brief statement given of the chief arguments of the more prominent contestants. The evidence collected by the Highland Society was reviewed; and the conclusion was reached that probably the view of the extremists on neither side was correct; that Macpherson neither found the poems as they now stand, nor forged them in their entirety; but that, having collected thousands of lines of Gaelic poetry of undoubted authenticity, he fused them together, himself supplying needed connectives, and in many cases adding passages of his own composition. The groundwork of the poems was held to be certainly of great antiquity; and the correspondence of the social conditions depicted in them with the real state of society in the third century (the supposed era of the Feine) was stated to be so

close as to have led Ebrard, the eminent German critic and antiquarian, to a firm belief in their authenticity as poems of that period. The concluding portion of the paper dealt with the subject matter of the poems, and with the light thrown on the question by early Irish manuscripts. As to the identity of the race called in the poems the "Feine," the writer ventured an original explanation of the meaning of the name, combatting the view of Mr. W. F. Skene, the Historiographer Royal of Scotland, who basing his opinion partly on a passage in an early manuscript, which speaks of "the Feine of Erin, Albyn, Britain, and Lachlan (Scandinavia)," holds that the Feine were a distinct race, widely extended over Britain and a part of the Continent. Mr. Spence argued on the contrary, that Mr. Skene might have mistaken the word "fine," meaning merely a "nation" or "tribe," for the proper name of a particular race, and thus that a widespread nation of the Feine may have had none but a conjectural existence. In short, that the "Feine" were simply the "Gaels" or Highlanders, who spoke of themselves as the "Fine"—the nation *par excellence*. The paper closed with the quotation of an eloquent passage from a poem in the Highland Society's report on the Ossianic controversy.

Mr. Chamberlain referred to a paper in the *Century* last year, that took up the same line of argument in relation to the connection between the Finne and the Gael. He mentioned the case of a gentleman who published an account of an Indian language that presented a case similar to that of the Ossianic poetry. It was taxed by Dr. Brinton as a forgery. The owner of the MSS. offered to show them to the public, but when they were looked for he said he had lost them.

Mr. Alexander Fraser expressed the pleasure he had felt in listening to Mr. Spence's paper. He thought that it was one of the most satisfactory contributions to the subject that had been presented for a long time. He thought that he had done what had not been done before, in placing the different poems together and showing that Macpherson wrote but a small portion of them. It could not be doubted that a large body of Ossianic poetry existed over and above that of Macpherson's, equal and some of it superior to his. The only question was whether Macpherson had taken part of the poems from one part of the country and part from another and connected them with some verses of his own. In poems recited by old inhabitants there were hundreds of lines similar to those of Macpherson's Ossian.

Mr. Evan McColl said there was no reason to doubt that these poems were handed down from very remote centuries. Numbers of Highlanders

could repeat thousands of lines of Gaelic poetry, which he had no doubt were handed down from one generation to another.

Mr. J. J. Mackenzie, B.A., read a paper entitled "A Preliminary List of Algae collected in the neighborhood of Toronto."

TWENTY-FIRST MEETING.

Twenty-first Meeting, 5th April, 1890, the President in the chair.

Donations and Exchanges since last meeting, 35.

Mr. R. F. Stupart read a paper on "Meteorological conditions during the past winter."

He said that the intense heating up of land and sea near the equator causes an up draught of air, which, ascending to the upper regions of the atmosphere, then flows away towards higher latitudes. Just north of the tropics a large portion of this upper current descends again to the surface and forms a belt of high pressure outward, from which, on the southern side, the north-east trade wind blows towards the equator, while on the northern side there is a general drift of the atmosphere from the south-west over the middle latitudes. The position of this belt of high pressure alters as the sun changes in declination, and hence the mean limit of the drift varies with the season, and varies also according as it is over land or ocean. Having this general flow of atmosphere from the south-west over the middle latitudes there must be return currents, and a large proportion of these are found in anti-cyclones moving south-east. In winter the formation of anti-cyclones occurs over the continents where the air cooled by radiation becomes heavy and contracts, and in consequence, air in the upper regions over the comparatively warm oceans flows towards the continents. It is probably not wrong to surmise that the almost permanent high pressure over Asia draws its supplies from over the Atlantic, and that the Pacific supplies America. The mean limits of the south-west drift at the surface of the earth may practically be identified with the mean track of a vast and persistent system of areas of low pressure or cyclones, which can be traced nearly around the globe, and which varies more or less from season to season and in different years.

During December an unusually persistent and rapidly moving stream o areas of depression from the Pacific passing over the northern part of the lake region kept back the flow of cold continental air which in average seasons at intervals flows over Ontario and Quebec in the form of anti-

cyclones. Connected with the high pressure to the south these areas caused prevalence of warm south-west winds. The Gulf of St. Lawrence at intervals during the month was affected by the northern anti-cyclonic waves which moved east, north of the lake region. During January in Western Canada there was a marked tendency for warm south to west winds, clearly attributable to the position of the storm track and excessive rate of movement of the storms. In Eastern Canada there was continually a distinct gradient for cold north to north-west winds owing to anti-cyclones having passed eastward far north of the lakes, closing in behind the storms as they left the coast. In February the average storm track was further south in the lake region and further north over the Gulf, thereby causing a greater prevalence of cold anti-cyclonic conditions than in January over the former part of the country and a lesser amount in the latter. He was convinced that on the position of mean track of storms, and on their persistency and rate of movement depends very greatly the character of seasons. He thought it not improbable that the position of mean track and the rate of movement may depend largely on the energy of the general drift of the atmosphere from the south-west over the middle latitudes. What causes most probably lead to a difference in this drift in correspondent seasons of different years? It seemed not improbable that a changing amount of heat received from the sun owing to solar disturbance might be the secret agency they were in search of What was the connection between sun spots and terrestial phenomena? A connection had been proved to exist between sun spot periods and magnetic declination. Many scientists had shown almost conclusively a connection between sun spots and rainfall. If the mean track of storms was affected by sun spot periods, then so must be the rainfall. It was possible that the failure to study rainfall in connection with storm tracks might have caused the agreement between maximum rainfall and maximum sun spot periods to appear less evident. On the position of the mean path of storms and on their persistency depended greatly the character of our seasons. Was there nothing in the fact that the spots or solar storms at periods of maximum were found near the equator, and that just before minimum they began to appear in higher latitudes, and that just after minimum there was often an outbreak far from the equator?

TWENTY-SECOND MEETING.

Twenty-second Meeting, 12th April, 1890, the President in the chair.

Donations and Exchanges since last meeting, 68.

Rev. J. F. Latimer was elected a member.

On motion of Mr. VanderSmissen, seconded by Mr. Bain, it was resolved, "That this Institute has learned with profound sorrow of the sudden death of Alexander Marling, Esq., LL.B., for many years a zealous member and efficient and faithful office-bearer, and desires to express its sense of this great loss sustained by the Institute in particular and also by the whole Province of Ontario which he has served so faithfully and well, and the sympathy of all members of the Institute with his sorrowing children and relatives, and that the secretary be instructed to transmit a copy of this resolution to his family."

Mr. A. F. Chamberlain, M.A., read a paper on "The American Indian in Literature."

After referring briefly to the treatment of the American Indian in fiction, with which he proposed to deal on a future occasion, the reader proceeded to discuss the American Indian as he is presented to us in the works of the poets of America and of Europe. First in chronological order as well as in importance (excepting a few notices of earlier writers) comes Shakespeare, in whose plays references to America, the West Indies, Mexico, Guiana, and the Bermudas are to be found. A passage relating to the "canibales" and the "antropophagus," which occurs in "Othello," carries us to the New World. But it is in Caliban in the "Tempest" that Shakespeare is most intimately concerned with America, for the ultimate conception of that strange being is to be found in the second hand information regarding the aborigines of the new continent that was at the disposal of the Elizabethian courtier and poet. Caliban itself is by most considered a metathesis of canibal, a word that preserves to us, in disguise, the name of a fierce Indian people of the Spanish Main. After briefly examining the character of Caliban, the reader took up some few isolated references to America and its aborigines in the works of Spenser, Jonson, and other contemporaries and successors of the great dramatist.

"The Cruelty of the Spaniards in Peru," by Sir William Davenant (1658), in which several Indian characters occur, and not a few spirited passages are to be found, was briefly referred to. After touching upon

Dryden, whose "Indian Queen" (1664) and "Indian Emperor" (1665), in one of which Montezuma figures, Pope's celebrated lines: "Lo! the poor Indian," etc., were cited. Passing by the intervening writers the reader next took up Southey's "Prince Madoc," a work founded on a Welsh legend relating to America, the scene of which is partly in Aztlan or Mexico and partly in Wales, and which contains some of the best passages in Southey. The next poet considered was Thomas Moore, who is best known, in this regard, by his ballad of the "Lake of the Dismal Swamp." Moore visited the United States and Canada, and has left us some charming pictures of the scenery of the great lakes and St. Lawrence. Campbell's celebrated poem, "Gertrude of Wyoming," was then referred to and the character of Outalissi, the Oneida warrior, discussed. The reader pointed out some of the exaggerations and misstatements in the poem. He then took up "Hiawatha," and the other works of Longfellow, the poet-laureate of the American Indian, dwelling briefly on its importance in the group of literary compositions under consideration. The "Burial of the Minnisink" and "The Driving Cloud," were also referred to. Bryant's "Prairie," Whittier's "Mogg Megone," "Nauhaught the Deacon," Lowell's "Chippewa Legend," Joaquin Miller's "Californian," and "Last Taschastas," were also taken up briefly. Reference was also made to the mumerous short poems of Mrs. Hemans dealing with American Indian lore and legend.

Passing to Canada the reader noticed the poems of Chauveau, Frechette and Lemay in particular. Amongst the writings of English-Canadians, the dramas "Tecumseh," by Charles Mair, and "De Roberval," by Col. Duvar, were discussed and interesting passages pointed out. Reference was made at some length to the poetry relating to the Indian to be found in the works of Mair, A. W. Eaton, Charles Sangster, and Prof. Roberts, as well as in those of less celebrated Canadian writers. Notice was taken also of Miss Pauline Johnson, a descendant of the celebrated Capt. Joseph Brandt. The reader closed by urging the importance of the Indian life, lore, and legend of our country as a source of poetic inspiration.

Mr. Bain called attention to a dramatic poem of the 18th century on Pocahontas, who was a favourite subject for dramatic authors. It was written by a Capt. Rogers, who, after the conquest of Quebec, was sent to Montreal. He was the first English speaking traveler who mentioned Toronto. After his return to England he wrote a journal of his travels and the drama of "Pocahontas." He exhibited the greatest familiarity with the Indian character.

TWENTY-THIRD MEETING.

Twenty-third Meeting, 19th April, 1890, Dr. Kennedy in the chair.

Donations and Exchanges since last meeting, 44.

A letter was read from the President of La Société pour l' ètude des Langues Romanes, announcing that on the occasion of the sixth centenary of the foundation of the University of Montpellier, the Society will hold a congress, and inviting the Institute to take part; when on motion by Mr. VanderSmissen, seconded by Mr. Chamberlain, Mr. Arthur Harvey was appointed delegate to attend on behalf of the Institute.

Sir Alexander Campbell, K.C.M.G., H. D. Weaver and Jackson L. Little, were elected members.

On motion of Mr: VanderSmissen, seconded by Mr. Chamberlain it was resolved "That this Institute has learned with profound regret of the death of General Sir J. Henry Lefroy, K.C.M.G., F.R.S., one of its earliest Presidents, and a most zealous supporter during his residence in Toronto, and that the members desire to express their sense of the loss which the cause of Science has suffered through his decease; and that the Secretary be instructed to forward to his son, Mr. A. H. Fraser Lefroy, Barrister, Toronto, a copy of this resolution together with a request that he will furnish the Institute a memoir of his late distinguished father suitable for publication in the "Proceedings of the Institute."

Mr. J. W. L. Forster read a paper on "Gleanings from European Art Fields."

He said there is little that is artistic in the Londoner or his city, yet the whole make-up is picturesque. Through smoke and haze in fine weather, or through fog and sleet in foul weather, a murky scrambling over the gables and street scenes gives a softening touch—a touch of mystery that is very fascinating to an artistic eye. He alluded to five great historic centres in the city of Paris. A pleasing pen picture was sketched of the old windmill on Montmartre, and of the Arc de l'Etoile as the centre of Napoleonic Paris, and the centre of that city's beauty as well. The four great relievo groups on this arc are worthy an essay in themselves. Special interest, of course, centres around the Champ de Mars. A high tribute is paid to the organizing genius of the *Directeur*

Generale and able lieutenantsin arranging with such perfect system an accumulation of industries so vast. In fact, French instinct and taste alone is able to provide a display so unique, charming with its touch of magnificence like a dream of the Orient, and with its evidence of utility so appropriate to the Occident. But it is in the art gallery Mr. Forster is most at home. He told how to look at pictures ; not to go at them with your eyes wide open and attempt to cram everything into your brain, but to approach them cautiously, feeling for the value of light, and for the sense of refinement, which is always present in a lasting work of art. The English pictures are pretty, tasteful, modest subjects. In producing luminous effects by a simple study of light, the Continental schools are far in advance of the English.

Mr. T. B. Browning, M.A., read a paper on "The Codification of the Law, (second paper), Real and Personal Property."

English property law, he said, is a growth marked by two main tendencies. The first results in multiplicity, as in the many real property actions (over 70) which were in use at the opening of the last reign, each of which gave a distinct relief. The second is towards unity, and consists in bringing to rule the jarring mass of remedies, principles, statutes and cases that had grown up in the law. In speaking of the codification of the property law, Mr. Browning held that the main obstacle to it was the maintenance of the division of property into real and personal, with its consequences, and argued for the abolition of the distinction and the reduction of property to a unified standard.

The following papers were presented :—

"The Déné Languages considered in themselves and in their relations to the principal linguistic groups," by Rev. A. G. Morice, O.M.I.

"The Philology of the Cree Languages," by Rev. E. B. Glass, B.A.

"The Crees sociologically considered," by Rev. R. P. Végréville, O.M.I.

TWENTY-FOURTH MEETING.

Twenty-fourth Meeting, 26th April 1890, the President in the chair.

Donations and Exchanges since last meeting, 92.

A communication was read from La R. Accademia delle Scienze del'

Istituto di Bologna, offering a gold medal of the value of 1,000 Italian lire for the best memoir on Galvanism written in Italian, Latin or French, to be received before the 11th of May, 1891.

On motion of Mr. VanderSmissen, seconded by Mr. Hamilton, it was resolved "that the Council be requested to take steps for obtaining materials for brief memoirs for publication in the "Proceedings" of such deceased members of the Institute as may have been distinguished for their services to Science."

Nominations for Officers and Members of Council for next session were then made.

Mr. Alan Macdougall, read a paper on "Present Efficiency in Sewage Disposal."

He described the several systems in use in this province and those lately under trial at London, on a large scale, and in one or two other places at private residences. Filtration was under trial, and so far the results were satisfactory. Sub-surface drainage, tried on a small scale, had stood the test for two winters. The tile drains were from 10 to 15 inches under the surface, and had not frozen. The porous carbon system came well recommended from England, and the poudrette exhibited was a practical illustration of what it could effect. The sulphate of iron, or Conder system was still *sub judice*, and he awaited the report on this system with much expectation and interest. It was said to have deodorized the Yonge street sewer completely. Samples of the treated sewage were exhibited during the reading of the paper.

Mr. Tully remarked that the system in use at the London Asylum, so far as it was tested was a perfect success; there was no effluent, it passes through the sand and disappears. In Guelph where the porous carbon system was used, it took 20 lbs. of porous carbon to 3,000 gallons of sewage, and the effluent was very pure.

Mr. L. J. Clark read a paper on "The Formation of Toronto Island."

He illustrated his remarks by a series of maps and drawings on the blackboard, showing the gradual development of the Island from its earliest stages. He believes the Humber and the Don to have furnished the substratum of clay while excavating their huge channels during a period when the waters of the lake stood at a higher level than at present. All indications go to prove that an ancient lake beach once existed at the foot of the range of cliffs just north of the present limits of the city.

Their subsidence was owing to the melting away of an immense glacier or icefield that extended all along the northern shore and cut off the exit of the water from the great chain of lakes by the St. Lawrence. Previously the outlet was through the State of New York, by Rome and Utica, and by the Hudson river. When it assumed its present level, Scarboro Heights formed a promontory which extended probably a mile into the lake. The heavy storms from the long reach of lake from the east produced their abrading effects on the promontory, and the abraded material was deposited to the west. This was the beginning of the Island, which has simply been added to from the same source, and by the same cause, acting through an unknown period of years. Mr. Clark acknowledged his indebtedness to the writings of Messrs. Hind, Sandford Fleming and Kivas Tully for a large portion of his paper.

FORTY-FIRST ANNUAL MEETING.

Forty-first Annual Meeting, 3rd May, 1890, the President in the chair.

Donations and Exchanges since last meeting, 49.

The Annual Report was read and adopted.

It was resolved, "That this Institute has learned with regret of the death of Mr. John Notman, who for a long number of years an active and valued member of the Institute, and for ten years its Treasurer, assisted materially in aiding and building up the Institute; that this meeting recognizes the loss the Institute has sustained, and conveys to Mrs. Notman and family the assurance of its sympathy in their great sorrow.'

E. J. Cousins and William Cutts were elected members.

Messrs. Hamilton, Macdougall, Ridout, Boyle, and Chamberlain were appointed a Committee to make arrangements for the summer meeting of the Institute at Niagara.

On motion of Mr. Chamberlain, seconded by Mr. Keys, it was resolved, "That the thanks of the Institute be tendered to the city newspapers for the notices of the meetings which have appeared in their columns, and especially to the *Mail* for the fulness with which it has published the reports of the meetings."

The following were chosen as Officers and Members of Council for the ensuing year :

President—C. Carpmael, M.A., F.R.S.C.

Vice-President—James H. Pearce, Esq.

Secretary—Alan Macdougall, M. Inst. C.E., F.R.S.E.

Treasurer—James Bain, Jr., Esq.

Librarian—A. F. Chamberlain, M.A.

Curator—David Boyle, Ph.B.

Editor—George Kennedy, M.A., LL.D.

Members of Council—W. H. VanderSmissen, M.A.
W. H. Ellis, M.A., M.B.
Arthur Harvey, Esq.
Maurice Hutton, M.A.
G. M. Rae, Esq.
W. E. Middleton, Esq., *Sec. Biol. Sec.*
W. H. Merritt, Esq., *Chn. Geo. and M. Sec.*
J. C. Hamilton, LL.B., *Chn. Hist. Sec.*

"In nature there is nothing mean or unworthy of attention."—*Huxley.*

PROCEEDINGS OF THE ORNITHOLOGICAL SUB-SECTION OF THE BIOLOGICAL SECTION OF THE CANADIAN INSTITUTE.

FOR JANUARY, FEBRUARY AND MARCH, 1890.

EDITED BY THE EDITING COMMITTEE.

(First Meeting, January 14, 1890).

[The nomenclature in use throughout these papers is that of the A.O.U., as published in 1886.]

1. **Pinicola enucleator at Toronto.**—On Jan. 12, on the Glen Road, in Rosedale, I observed a flock of Pine Grosbeaks about twenty in number. They came from the south-west and alighted in a clump of pine-trees; this was about half-past three in the afternoon; a few minutes previously, Mr. Thompson informs me, he saw the same flock on Howard Street, where they were feeding on the berries of the mountain ash, surrounded by a large flock of English sparrows, which were resenting the intrusion by noisily chirping, but not attempting any violence. Later in the afternoon I saw another flock, about the same size, flying over from the north. They were very shy, from which we might argue that they had been for some time in the neighborhood, for usually, on first arriving from the north, these birds are so tame as to be easily knocked down with sticks.—JOHN EDMONDS.

2. **Ampelis cedrorum.**—While walking in the ravine of St. James' Cemetery, on the morning of Jan. 1, I came on a pair of Cedar-Waxwings; they were perched on a tree about thirty feet from where I stood, in clear view, so that there is no doubt about the identification. I mention this, because although Mr. McIlwraith gives the cedar bird as a winter as well as a summer resident, there are very few, perhaps not more than four or five, authentic records of its occurrence about Toronto in the winter.—J. L. JACKSON.

(Second Meeting, January 28, 1890).

At this meeting the officers of 1889 were re-elected for 1890.

3. **Sitta canadensis wintering.**—On January 18, while shooting at West Toronto, I shot a pair of Red-Breasted Nuthatches. This is said to be the first report of these birds being taken this winter around Toronto.—C. E. Pearson.

4. **Megascopsasio.**—On January 19, while out collecting, I came on a Mottled Owl, but was unable to secure it having changed the charge in the gun so as not to injure it with too heavy a shot.

5. **Larus marinus wintering here.**—On the same date I saw a number of Saddle Back Gulls flying about Coatsworth's cut and the sand bar, in company with a number of other gulls.—J. R. Thurston.

6. **Spinus tristis and Ampelis cedrorum wintering.**—On same date I saw three Cherry Birds near Logan's crossing, on G. T. R. also saw a large flock of Goldfinches feeding on weeds in a field near Chester.—J. L. Jackson.

7. **Hybrid Pinicola enucleator X Carpodacus purpureus.**—On Jan. 22, 1890, a small-sized finch which was taken from a flock of Pine Grosbeaks (*Pinicola enucleator*) was brought into my store. As the bird was new to me I had it submitted to Dr. J. A. Allen, who says: "It is clearly a hybrid between the common Purple Finch and the Pine Grosbeak. * * * It is certainly a most interesting capture, combining about equally the characters of the Pine Grosbeak and the Purple Finch. It is just half way between them in size and very nearly so in all other features." The specimen is as follows: male, ad, l. 6·75, wg. 3·75, tl. 1·25 inches; general color like that of our adult male Pinicola in very high plumage. The red on the breast being particularly rich; the back, wings, sides of breast and belly are nearly of the warm color of *Carpodacus*, without the slaty tints of *Pinicola*, and streaked as in the smaller species; the under tail coverts are lined as in *Carpodacus cassinii;* the bill with its antrorse feathers is just intermediate in shape and color, but is larger than that of some adult Pinicolæ.—W. Cross.

8. Dr. Brodie reports that he saw another specimen of the above hybrid early in the season. It was in the female plumage and clearly observed but not collected.

While in Manitoba in 1883, I met with a Mr. Babb, who told me of a strange bird that he shot in Western Ontario some years before; neither

he nor the local taxidermist had ever seen one like it; although both were acquainted with the Pine Grosbeak and the Purple Finch. He described it as being between the two in size and color, and he said that they had always referred to it since as the "Strawberry Finch."—ERNEST E. THOMPSON.

10. **Pinicola enucleator in Rosedale.**—On January 7, I met with a flock of about fifteen Pine Grosbeaks in the woods north of Rosedale. They were feeding on basswood seeds. I procured five specimens. On the 18th, I shot a female of the same species, which was sitting alone, on the top of a tree, calling to passing flocks. On January 24, I saw several more small flocks, in different parts of the city feeding on the berries of the mountain ash, and have observed them eating snow at different times since.

11. **Acanthis linaria.**—On January 24, I found a large flock of about 70 or 80 Redpolls and shot three specimens. These are the first I have seen since October 1, 1889.—J. B. WILLIAMS.

12. **Sturnella magna wintering near Toronto.**—On January 24, while out near Mimico, I saw three Meadow-larks. They were flying over an open field. This is not the first instance of the kind, as in the winter of 1881-2 I observed several individuals about the Woodbine race-track, where they remained till spring; also in the "Auk" for April, 1888, p. 211 is a note by Dr. Brodie on a male *Sturnella* which was taken on Feb. 21, 1881, at Highland Creek, east of Toronto.—ERNEST E. THOMPSON.

13. **Pinicola enucleator on Spadina Avenue.**—On January 17, while walking around Spadina Crescent I heard a call note almost new to me, and looking up saw seven birds fly into a mountain ash tree on the west side of the street; following them I found they were Pine Grosbeaks. I took my catapult and shot a fine male. The rest flew to the next tree, and I found there were two more males in full plumage, young male and three females. On the 18th I saw another flock, or perhaps the same, in Sir Adam Wilson's grounds on the crescent, but could not procure any. On January 25th, on Bathurst Street, I shot a young male out of a flock of about fifty, which were feeding on the ground on the black ash and mountain ash seeds. The same afternoon I shot an adult male and a female, in Mount Pleasant cemetery; and on January 25 I shot another male in the grounds at 396 Bathurst street, and I have not seen any since that day.

14. **Merula migratoria wintering.**—On January 25, near the reservoir, I heard a familiar but out of place call, and turning saw my friend

collect a fine specimen of Robin. This is the first record of its being taken around Toronto this winter.—G. E. Atkinson.

15. **Sphyrapicus varius.**—The specimen of the Yellow-Bellied Sapsucker exhibited is a female taken in Rosedale woods on April 14, 1887, and I also exhibit specimens of maplewood bored by her. I watched her for some time that morning, and found there was one tree on which she remained when undisturbed. On this tree, about six feet from the ground, she had bored about twenty holes from which sap was plentifully exuding. I sat down near the tree, and she came back, but kept on the side away from me. But the richest supply of sap was on my side of the tree, and she was evidently anxious to get at it, but feared to come into full view; once she came half round, then suddenly withdrew and ran to the top of the tree, but the temptation was very strong, and she came slowly down again; after a while, as I sat very still, she gained some confidence and would remain for a second or two on my side drinking the sap. I came back again in the afternoon with a gun. She was still there, but I missed with the first shot, and she flew away, but I found her near by in company with a male bird which I procured. I returned to the tree, and found her there with another male, and she slipped away leaving her companion to be shot. I went back in about half an hour and she was there, but very cautious, and three times did I try to creep towards her before I got her. There seemed to be an irresistible attraction in that tree, as she always returned to it as soon as I left the spot. Apparently she was on the look out for a husband, and was treating those who passed to a drink of the sap which she had spent the morning boring holes to procure. I find, from records, that these birds arrive here about the 14th of April, and almost disappear about the 18th.—J. B. Williams.

16. **Pinicola enucleator in Rosedale.**—On Jan. 12, I went along the C. P. R. track eastward from Toronto, and soon came on a large flock of Pine Grosbeaks and following them, procured ten specimens. On January 25 I took my glasses and went out to make observations; on the way I saw two small flocks of Pine Grosbeaks, and presently after arriving at my former stand I saw a flock of about twenty; they came from the north and alighting for an instant on the trees on the hill they flew to an adjoining orchard and then down to the ground, along which they worked toward me, shelling and eating the seeds of the white ash as fast as they could pick them up.

17. **Corvus americana wintering.**—On January 26, while walking along the track, I saw a flock of about 100 Crows perched on a

large pine tree on the side of the track. I have also observed large flocks at Eglington, Ont., this winter.

18. **Field Mouse impaled by Lanius borealis.**—If on and Field Mouse (*Arvicola riparius?*) impaled on a thorn by the Butcher Bird in some small thorn bushes in Rosedale, on January 27th, but did not see the butcher.—JAMES H. AMES.

19. **Aquila chrysaëtos.**—The Golden Eagle is represented in my store by the immense wings and claws of a specimen that was killed in Muskoka, August, 1889.

20. **Haliaëtos leucocephalus.**—A male Bald Eagle was shot a little west of Kingston, Ont., in August, 1889, and sent to me.

21. **Syrnium nebulosum.**—Six years ago the Barred Owl came in numbers, since then it has been hard to obtain a specimen till this season, during which about a dozen have been brought to my store. The largest and finest was a female that was shot on the R. C. Archbishop's Palace on Sherbourne Street. It measured :—lg. 20½ ; wg. 13 ; tl. 9¾ inches.

22. **Ulula cinerea.**—The Great Grey Owl has this year been very common in Ontario. During the last thirteen years I have handled five or six specimens in my business as taxidermist, and have heard of but a few other Ontarian specimens. But this winter (1889-90) I have received twenty-three specimens, and have had them reported from various parts of the Province. One of my acquaintances stationed at Barrie received twenty-six this season. They began to come into this region in November, and increased in numbers up to February, after which they became very scarce again. Mr. Thompson suggests that the unprecedented fall of snow in the North-west may account for this unusual migration of owls, as it would effectually conceal the swarming *Arvicolæ* of the boreal regions, and thereby rob the owls of a staple article of diet and compel them to migrate.

23. **Nyctala tengmalmi richardsoni.**—The Richardson's Owl is equally rare in all seasons here. I never receive more than three or four in a year, sometimes none at all. They are usually taken in the fall, but occasionally in the early spring time.

24. **Nyctala acadica.**—The Saw-whet is our smallest species, much like *richardsoni* on a small scale. It is always scarce; this season even more so than usual. In the fall of 1889 they appeared in great numbers on Toronto Island. One man assured me that he collected over twenty-

six in one tree, eight of them being taken alive, and as he brought six of them at once, I am bound to believe him; especially as several more were brought in at the same time by different persons. All of these that I saw were in the adult plumage. I have had but two in the young plumage. One was taken in July and one in August, both near Toronto.

25. **Megascops asio.**—As is well known, the Screech Owl is found in two plumages, a red and a grey. These are said to have no relation whatever to age or sex. Of those taken here about 90 per cent. are in the grey plumage, and every one of the red ones that have come into my hands was a female. In July, 1889, I received a brood of this species. It contained three grey and one red young, partly in the down, but showing clearly their colors; the mother was red.

26. **Bubo virginianus.**—The farmers who occasionally bring in the Great Horned Owl relate wonderful tales of the prowess of this bird, and of the loss their poultry yards sustain at his claws. One man credibly informs me that such is the courage and strength of this bird that settlers in Muskoka have great difficulty in keeping a cat, for these owls never hesitate to attack the feline and soon succeed in destroying it.

On March 25, 1889, Mr. Jackson of Maple found a Horned Owl's nest in a hole in a decayed tree, at a place eight miles north of Toronto. The nest was made of finely shredded strips of cedar and basswood bark, and contained eggs on which the bird was sitting.

27. **Nyctea nyctea.**—The Snowy Owl was very abundant here in the winter of 1884-5; since then it has been a rare winter visitant, not more than three or four being seen each season till this winter. In November, 1888, they came in great numbers and continued to arrive during December. In January the last of them appeared. About forty, as nearly as I can ascertain, were shot near Toronto this year; two of these were shot in the centre of the city.

28. **Surnia ulula caparoch.**—The Hawk Owl has always been rare here. I can count on the fingers of one hand all that I have received in fourteen years. I know of but four having been taken near Toronto, one that I received from Thornhill, and three that are elsewhere recorded by Mr. Thompson.

For *Asio accipitrinus* in flock see Proc. Orn. Sub-s. 1889, p. 20, par. 134.

In all nine species of Owl have been procured in the heart of the city of Toronto. This includes all our Owls except the Barn Owl, (*Strix Pratieola*) and the Hawk Owl.—WM. CROSS.

(Third Meeting, February 11th, 1890).

29. At this meeting so many fragmentary observations on the *Coccothraustes vespertina* were presented, that it was decided to hold them all over for a single concise report at the end of the season.

30. **Nesting of the Seiurus noveboracensis.**—The favorite haunts of the Water Thrush are low swampy woods, or the margins of muddy creeks and drains. Its nesting places are, of course, in similar localities. Although I have been a resident of Canadian backwoods from my early days, and have rambled many a day and many a mile through pathless wilds and was, moreover, perfectly familiar with the bird itself, I had never seen the nest or the eggs of this Wagtail until the summer of '82, when in the early part of June, being in a piece of swampy bush, I discovered a nest containing four eggs and a young Cow-bird just hatched. The nest was in a hole in a large turned-up root of a tree, under which was a large pool of water into which the bird jumped when flushed from the nest. Her exit from the pool and her disappearance among some brushwood were, however, but the work of a moment, and while I was examining the nest she returned and I became certain of her identity, otherwise I would have taken the nest for that of a Junco, so much did it and the eggs resemble those of that bird. On May 22nd of the following year, as I was crossing a piece of swamp or wild-wood, I noticed, near the root of a fallen tree, a Water Thrush, which by her notes and actions intimated that her nesting place was near. Taking off my boots I waded into the water beneath the overhanging root and found on a kind of shelf about a foot above the surface of the pool, a nest containing two eggs. This nest was composed externally of moss, rather loosely put together and lined with dry fungus of a small species, fine grass and hair. On the 24th I returned and found that five eggs in all had been deposited. I took them and they are now in my collection. These are of a white hue, having the large end umber brown, and the greater part of the surface irregularly dotted over with small spots of the same color. Last spring I saw in the same root another nest of the same species containing four of its own young and one of a Cow-bird. This seems to indicate that, if not much disturbed, it will nest repeatedly in the same place, though it does not a second time occupy the same nest.—WM. L. KELLS, Listowel, Ont., 1885.

31. **Disappearance of Forest Birds, etc.**—Hon. Charles Clarke writes me from Elora on the disappearance of *Ectopistes migratorius, Melanerpes erythrocephalus,* and on the advance of *Dolichonyx oryzivorus, Corvus americanus* and other species, as follows: "April 27th, 1885,—Our woods, alas! are rapidly disappearing and with them many of our summer visitors. There are young men here who have never seen a Wild Pigeon, and some to whom the Red-headed Woodpecker is a rare if not an unknown bird. The Bobolink, however, has increased largely with us since the disappearance of the forests; as also have the Crows and Blackbirds within the last few years. The English Sparrows, too, have greatly multiplied in our village, but have not yet extended to the farms in the neighborhood."—Ernest E. Thompson, 1885.

32. **Nesting of the Certhia familiaris americana.**—The Brown Creeper has been observed in our wild-woods nearly every month in the year. Its general habitat is the low swampy woodland where there is an intermingling of evergreen with black ash timber. Here, also, it selects its nesting place. This is usually in some old black ash stub, where the small flakes of bark have become partly detached from the trunk and curled up and which frequently projects far enough to afford the required room for the nest. I have, on several occasions and in different places seen its nesting place, but only in one instance have I taken its nest with eggs. This was in the early part of May, 1878, at which time I was out in North Wallace on a farm where I had previously resided for a number of years, when I observed a pair of these birds busily engaged at nest-building. The place was on the margin of a beaver meadow, and the nesting site between a piece of bark and the trunk of a hemlock tree, nearly twenty feet from the ground. The female collected and placed in position all the material of the nest, but her partner seemed to think that he was giving her much assistance by following her to and from the nesting place and running up and around the trees and old logs from which she collected the materials, at the same time warbling his little ditty in a pleasing manner. Rough pieces of cedar bark formed the foundation of the nest, then dry fibrous woody matter composed the main part of the structure, which was completed by a warm lining of hair. Some ten days afterwards I again visited the place, but had some difficulty in reaching the nest, the lower part of the tree having been scorched by fire, and the bark peeled off the year before. On getting up to the desired spot the bird flushed out, and I found in the nest six eggs which I took, and in preparing them ascertained that incubation was considerably advanced. One egg was broken, the other five are in my collection. The ground color of the eggs is

dull white with a mottling of bay dots towards the larger end, and a slight sprinkling of the same hue on other parts of the surface; in size they are somewhat more oblong than those of the Black-capped Chickadee.

I might also remark that I noticed the individuals of this species very active during the thaw in the latter part of December last and the beginning of the present year, but I did not see or hear the bird again until the 6th of April—WM. L. KELLS, Listowel, Ont., 1885.

33. **Dryobates villosus and its prey.**—Some time ago I saw a Hairy Woodpecker pegging away at a stick of dry cordwood in my yard. I took an axe and split the stick, and found in its centre a large white grub, the *larva* of a *Tremex columba* (*Dru.*)

34. **Trochilus colubris and Spiders.**—I have captured more than one Ruby-throated Humming Bird with its legs, bill and wings enveloped in spider's web, proving the correctness of the assertion of certain naturalists that humming birds prey upon some of the smaller species of the Family *Arachnidæ*.—REV. VINCENT CLEMENTI, Peterboro, Ont., 1885.

35. **Coccyzus erythropthalmus.**—In regard to erratic nesting of the Black-billed Cuckoo I have been collecting as much evidence as possible, not wishing to insist too much on my own observations. The three cases detailed were under the notice of several perfectly reliable observers, and, of course, I was a witness myself. I think you need not have the slightest hesitation in accepting the notes as scrupulously accurate, as anything of a problematical nature has been carefully eliminated. Of course, it is to be regretted that full details were not jotted down as the cases occurred, and it is possible that even now some ornithologists will not be convinced by anything short of the *identical* young Cuckoos—however, it is useless to make regrets, and I doubt not the young Cuckoos have long passed that age when they would be easily recognizable as the heroes of my story.

The observations were made at Elora, and the statements are corroborated by my father and sister.

The arrival of the Cuckoo in our garden was always an event taken particular notice of, and, as the bird was comparatively rare, its movements were carefully watched. It had a clean reputation during its first season, and if it did any "hatching by proxy" no one was clever enough to discover the fact, and several years passed before we were forced to acknowledge that *our* Cuckoo had become as degenerate as its British relative, and losing the respectable character generally accredited to the

American bird. Such was the fact though, and the discovery caused so much surprise that the bird was more closely watched than ever.

Case I.—A Cuckoo was noticed constantly haunting the vicinity of a cedar hedge, and as the bird behaved in what we considerd a very bold manner for a cuckoo of decent bringing up, it was thought advisable to seek a reason for the peculiar deportment of the bird. An investigation of the cedar hedge was made and a chipping sparrow's nest found, and, as might have been expected, eggs were in the nest. There would have been nothing remarkable in the discovery had all the eggs been sparrow's eggs, but they were not, and one looked very much as if it might belong to a Cuckoo. I must confess that a connection between the Cuckoo and the mysterious egg was, at least, suggested to our minds, and no one was astonished when a *genuine* Cuckoo did actually come out of the egg, although I can imagine the poor sparrow mother being puzzled over her child.

Next year the Cuckoos returned, and were evidently ashamed of their former conduct, for a nest was built of a few crossed twigs in the crotch of a Talman apple tree, and in due time two young birds made their appearance. These little fellows were undoubtedly of the same family as the stranger found in the sparrow's nest the year previous, and all had the hedgehog appearance, so characteristic in the young Cuckoo.

Our faith in the Cuckoo having been shaken no surprise was manifested when Case II. was observed.

Case II.—Just in front of the house was a clump of Tartarian Honeysuckles, and here some little yellow warblers built every year, notwithstanding the fact that they had, on several occsaions, been rudely disturbed by inquisitive intruders. A Cuckoo was noticed "spying out the land," and was, of course, watched and eventually discovered *coming from* the warbler's nest. The visit was evidently a satisfactory and reassuring one, as an egg was left for the warbler to take care of. If the warbler observed anything unusual in the appearance of the contents of the nest, she kept the discovery to herself, and went resolutely to work to hatch out a warbler superior to any of her race. When the brood was hatched one bird proved a source of surprise and admiration to his parents, who had to work without rest to supply their hungry child with food. Their efforts were prodigious and might have been almost laughable had it not been apparent that a tragedy was about to occur, as the young warblers were neglected on account of the intruder. By and by, as the Cuckoo grew, it was but natural the nest should seem small for such an important fellow, as he was, and he soon discovered a simple method of improving the household arrangements. He crowded out his companions who

were then carefully picked up and placed in a cottonwool nest hung up near by, in the hope that the old birds would look after their young. However, the Cuckoo required a great deal of attention and the natural, or rather unnatural result was that the young warblers were neglected and died in a short time. During the whole period the old cuckoo was an interested observer of all that was going on, and was always to be found flitting about the nest in a restless manner, as if she had her doubts in regard to the ability of the warblers to take care of her child. The young Cuckoo learned to navigate for himself in course of time and disappeared eventually, but not before his identity was completely established.

Case III.—The third case is one that leaves no room for doubt in the mind of the most sceptical. In an orchard we discovered a Cuckoo *sitting* in a Chipping Sparrow's nest, and the bird did not attempt to move till we almost touched it. It now seemed very evident that the case against the bird was a strong one, and when a Cuckoo's egg was found in the nest, the chain of evidence was complete. The egg was hatched and produced a tyrannical young Cuckoo who turned his companions out of the nest, and made himself as comfortable as possible as long as was necessary. Two of us saw the old Cuckoo actually sitting in the nest, and there was no doubt about the matter. We are informed that the erratic nesting of the Cuckoo has been repeated in the same orchard since the date referred to, but of this we have no accurate information.

This is the evidence upon which I base my case against the American Cuckoo, and I think the jury will find no difficulty in finding a verdict of "guilty." Of course, the ornithological lawyer for the defence will say these people do not know the difference between a "Cow blackbird and a Cuckoo!" All that can be said in reply to this is that *our* Cuckoos were not *Cow blackbirds*, and if the Cuckoo is more degenerate in the locality of Elora than in other places, so much the worse for the locality. C. K. CLARKE, M.D., Kingston, Ont., 1885.

37. **Habia ludoviciana.**—The Rose-breasted Grosbeak arrives here according to season, from May 4 to 12, the males about five days before the females, and leaves about September. It builds its nest about June 1; lays three or four eggs, and hatches but once. If, however, the nest is destroyed, which is very often the case, because it is very slightly built of dry twigs, it builds again. The female sits on the nest in the forenoon, then the male relieves her till dark, when she takes the nest again.

Although this Grosbeak has a very powerful bill like those of its tribe

which live on nuts and hard seeds, it lives mostly on insects; even in a cage it will not thrive unless it gets a change from seeds to soft food, such as eggs, meat, bread and milk, etc. But his beautiful song will fully repay any one who will take the trouble to find proper food for him.

This bird effectually extirpates the Colorado potato beetle, if the potatoes are planted near the woods. The young are all alike in the brown streaky plumage, except that the males have the under wing coverts red and the females have them yellow. This mark distinguishes them at all ages. The late young do not shed their feathers before leaving, and the young males arrive the next spring in dress like that of the female, except that there is a little red on the breast. The full black male plumage is not obtained till he is three years old, and one might get twenty-four birds in different intermediate stages without seeing two just alike. This species moults twice each year, in spring and in fall.—W. A. Schoenau, Mildmay, Bruce, Ont., 1885.

38. **Junco hymelis, Pinicola enucleator, Acanthis linaria.**—On January 29, I shot one Junco and one Redpoll and two male pine Grosbeaks; the stomachs of the latter were full of seeds of the black ash. On February 13, I saw a female pine Grosbeak feeding on the cones of a tamarack tree.

39. **Pinicola enucleator.**—On January 26, I saw a female Pine Grosbeak, and wounded it but did not secure it. On February 7, I was passing the same place and I shot a female Pine Grosbeak, and on examining it I found it was the specimen I had wounded on January 26, and the bird was just on the mend when I shot it, and seemed in good condition, the stomach containing a few black ash seeds.—Jas. A. Varley.

40. **Lanius borealis.**—On February 10, I found a dead specimen of the Northern Shrike. It was lying beside a fence in Rosedale, where it had evidently been dropped by the shooter as he was climbing the fence, as there was no shot in the fence over where it lay.—Jas. R. Thurston.

41. **Loxia leucoptera at Toronto.**—On February 8, I received one male White-winged Crossbill, shot at Toronto.

42. **Pinicola enucleator capture.**—On February 11, I captured a female Pine Grosbeak with a snare on a pole, for which exploit one of her companions gave me a noisy scolding. I have seen flocks of these birds on Huron, Baldwin and McCaul streets, where they have stripped the mountain ash of their berries.—Wm. Cross.

43. **Pinicola enucleator.**—On February 9, in a mountain ash, on College avenue, Toronto, I saw a number of Pine Grosbeaks which were very tame; I could easily have knocked them off with a stick. On another tree I saw a flock of about fifty, equally composed of Pine and Evening Grosbeaks (*C. vespertina*), one of the former in red plumage. They were so tame they would not fly, although I killed a couple of them. On February 10, I saw dozens of Pine Grosbeaks in various mountain ash trees in the city, but only one with red plumage.

44. **Plectrophenax nivalis.**—On February 8, I saw the first snowbirds, that I have seen this year. On February 9, in a field north of Bloor street, I saw a flock of 1,500 or 2,000, they literally covered a large field which was overgrown with tall weeds, on the seeds of which they seemed to be feeding.—H. H. BROWN.

45. **Observations on Pinicola Enucleator.**—While strolling in the woods north of Rosedale, on February 9, I observed a flock of about twenty Pine Grosbeaks. Among them were several adult males. I watched them feeding and found they were eating a black berry, apparently viburnum. Owing to the large quantity of snow on the ground they were unable to procure their favorite food, the seeds of the white ash.—J. H. AMES.

46. **Pinicola enucleator.**—On February 8, I saw two flocks of Pine Grosbeaks in Rosedale, about six in each flock, and collected four specimens, one adult plumaged male and three females. On February 9, I saw several more small flocks of the same species and one female Evening Grosbeak (*Coccothraustes vespertina*), in Rosedale.—JOHN EDMONDS.

47. **Otocoris alpestris praticola arrived.**—On February 6 I observed Shorelarks at East Toronto.

48. **Plectrophenax nivalis on Telegraph wires.**—On February 11, I saw three Snowbirds alight on a telegraph wire in East Toronto. This is the first occurrence of the kind noted.

49. **Pinicola enucleator.**—Pine Grosbeaks have been very common in East Toronto, for the past few days.—C. W. NASH.

50. **Pinicola enucleator.**—On February 2, I saw a pair of the above species in Rosedale, and procured one adult plumaged male.

51. **Syrnium nebulosum.**—On February 6, I saw a Barred Owl sitting on the city morgue, on Esplanade street.

52. **Merula migratoria wintering.**—I saw a Robin near the C.P.R. track in Rosedale, on February 9th.—J. L. Jackson.

53. **Pinicola enucleator in the Park.**—On February 10, while on my way to school I saw one of these birds sitting on the top of a pine-uttering a loud call. In the Park Crescent I saw another. On February 11, I saw several and secured one alive.—C. E. Pearson.

54. **Large flocks of Pinicola enucleator around the city.**—On February 8, I saw a large flock of Pine Grosbeaks. I shot two and stunned another which I now have alive. On 9th I collected three red males, two young males and three females. On 10th I got three more, two of them alive.—Geo. E. Atkinson.

(Fourth Meeting, February 25, 1890.)

55. **Pinicola enucleator and Acanthis linaria.**—On February 12, I shot two female Pine Grosbeaks, and two females and one male Red. poll in the Park. On February 13, shot one female Pine Grosbeak and another male Redpoll at the same place. On February 21, I saw a flock of seven Pine Grosbeaks feeding on the tamarac cones in the 'Varsity grounds, but did not secure any.—C. E. Pearson.

56. **Pinicola enucleator.**—On February 13, I went out with a snare on a fishing pole and caught a young male Pine Grosbeak, and saw several more but they are beginning to be very shy. February 14, I caught another young male that was in company with a bright red male. On February 20, I came across two more, one I knocked down with a stick, it proved a male in adult plumage, with yellow markings among the red on the crown, throat, about the eyes and down the back.

57. **Sitta canadensis wintering.**—On February 16, on Well's Hill, I saw a pair of Redbreasted Nuthatches and collected the female.—Geo. E. Atkinson.

58. **Two Cinereus Owls.**—(*Ulula cinerea*), were received from Mount Albert, Ontario, on February 12.

59. **Ampelis garrulus in Ontario.**—Three Bohemian Waxwings were shot at Port Dover, Ontario, on February 20, and one of them sent to me.

60. **Zenaidura macroura.**—A Mourning Dove was shot about six miles east of Toronto on March 24. It was in good adult plumage.—Wm. Cross.

61. **Otocoris alpestris praticola and Pinicola enucleator.**—On February 15, I shot two specimens of the former. Mr. Ernest E. Thompson informs me that *praticola* is the breeding form and the only one found here in the spring migration. The only Toronto specimens of *alpestris* that he has seen were taken in the fall migration. On same day I saw two Pine Grosbeaks (*Pinicola enucleator*), in St. James's Cemetery.—J. B. WILLIAMS.

62. **Pinicola enucleator, Otocoris alpestris praticola, &c.**—On February 13, I saw a flock of Pine Grosbeaks on Sherbourne street. On February 22, saw a flock of Redpolls (*Acanthis linaria*), on a sand bar, and a flock of Shorelarks feeding on manure at Ashbridge's Bay.—JOHN EDMONDS.

63. **Crymophilus fulicarius and phalaropus lobatus at Toronto.**—A specimen of the Red Phalarope was shot on Toronto sandbar on May 23, 1889, and a specimen of the Northern Phalarope was shot the same spring and in the same place. I received both specimens from the shooter.—J. R. THURSTON.

64. **Stercorarius parasiticus at Toronto.**—Mr. Loane has recently shown me a Parasitic Skua that he shot on Ashbridge's Bay in September, 1885. The bird was mounted and in a sealed case and therefore not available for measurements, but a careful comparison with an authentic specimen in my hands satisfies me of its identity. It is in the dark phase of color, everywhere sooty, darker on the quill feathers, lighter on the crissum, mottled with whitish on the hind neck, back and crissum, central tail feathers pointed and projecting about three inches.

During September and October, 1889, Mr. Loane observed another specimen apparently of this species. It was not shot, but he several times saw it close at hand and described it as like the above but redder on the belly. On one occasion it carried off a Plover he had just shot. The other gulls (*Larinae*) seemed afraid of it and would rise and fly off. squawking when this one came near them. The specimen is not known to have been shot, but it disappeared late in October.

65. **Linota cannabrua at Toronto.**—On January, Mr. Loane informs me that he saw two strange birds accompanying a flock of English Sparrows that were feeding on a pile of stable refuse near the Bay. One of these he captured in his net and now has it in a cage where it is doing well and occasionally singing. On comparing this bird with a male specimen of the English Linnet (No. 25143 Am. Mus.) kindly loaned me for the purpose by Dr. J. A. Allen of the American Museum, I have no hesita-

tion in pronouncing it one of the same species. I held the two birds together and made a careful comparison; in size and structure they agreed exactly; in color they were alike but the Toronto bird had little or no red on the crown, which was streaked dusky, and the plumage was everywhere darker and duskier; the differences fairly paralleling those which exist between eastern and central basin forms of American species. The question how the birds came here is not easily answered for this could not have been a cage bird escaped as its breast still bore the rosy tinge that is so soon lost in captivity. I have not heard that the species has been introduced artificially anywhere into Canada.—E. E. Thompson.

66. **Pinicola enucleator.**—During the winters of 1882-3 and 1883-4, a large number of these handsome birds appeared in our gardens, even in the centre of the town. They were first seen on the mountain ash trees and were busily engaged in devouring the dried berries.—Rev. Vincent Clementi, Peterboro', Ont., 1885.

67. **Rare birds in Toronto University Museum.**—Through the courtesy of Professor Ramsay Wright I have been enabled to examine the following rare specimens in the above named museum:

68. **Gannet** (*Sula bassana*).—One specimen, in immature plumage shot at Oshawa, Ontario, by Mr. A. Dulmage, in 1862. The full particulars were published at the time in the *Canadian Journal*, (July, 1862, p. 329), by Professor Hincks.

69. **Richardson's Jaegar** (*Stercorarius parasiticus*).—A fine adult specimen marked "Toronto." The plumage is exactly as described in Cones' *Key*, first edition. The dimensions as follows:—Length about 19; wing, $13\frac{1}{4}$: tail, 5, or to the end of the two pointed central feathers, 8; beak, $1\frac{1}{4}$; tarsus, $1\frac{5}{8}$; middle toe and claw, $1\frac{11}{16}$.

70. **Evening Grosbeak** (*Coccothraustes vespertina*).—A male and a female of this species are exhibited, the male is marked "Presented by T. S. Cottle, Esq., of Woodstock, 1857." Possibly taken from the flock recorded in the *Canadian Journal* (July, 1855, p. 287). However, there are no records to prove either that it was so or that there was a second migration in 1857; the latter is quite likely.

71. **Cardinal Redbird** (*Cardinalis cardinalis*).—A fine male specimen marked "Weston, Ontario," (a north-western suburb of Toronto).

72. **Yellow-throated Vireo** (*Vireo flavifrons*).—A pair marked "Toronto."

73. **Bohemian Chatterer** (*Ampelis garrulus*).—One specimen marked "near Toronto."

74. **Cape May Warbler at Hudson's Bay.**—A single specimen of *Dendroica tigrina*, marked "Hudson's Bay."

75. **Cœrulean Warbler** (*Dendroica cærulea*).—A pair, male and female adults, marked "Toronto, 1856."

76. **Woodthrush** (*Turdus mustelinus*).—A single specimen marked "Toronto."—ERNEST E. THOMPSON.

(Fifth Meeting, March 11, 1890.)

77. Among the letters read was one from Professor Robert Ridgway, of the Smithsonian Institute, acknowledging receipt of the copy of Proceedings of the Subsection that had been sent him and remarking, "I am exceedingly pleased with the appearance and contents of the "Proceedings," and trust that the important records which the ornithologists of Toronto have begun may be continued for many years to come. The arrangement of the memoranda, while different from anything that I remember having seen before, is an admirable one, and for convenience of reference seems to be most excellent. Should these Proceedings be kept up, they will result in a series of records which cannot help being of the utmost value to science, and a credit to those who originated the plan of their publication, as well as those who foster and encourage the good work."

78. **Arrivals in 1889 at 3rd Concession, York.**—On February 17, I saw the first Bald Eagle (*Haliætus leucocephalus*). On March 16, I saw first Meadow Lark (*Sturnella magna*), and on May 15, the first Ruby-throated Humming Bird (*Trochilus colubris*).—W. SQUIRES.

79. **First Sialia sialis at Lorne Park.**—On March 1, Mr. R. A. Luker observed two or three Bluebirds as above.—ERNEST E. THOMPSON.

80. **Accipiter cooperi.**—On October 12, Mr. Geo. Powell shot a fine female specimen of Cooper's Hawk in Ashbridge woods, east of Toronto; its crop and stomach were distended with the flesh and small bones of a domestic Pigeon.

81. **Asio wilsonianus.**—On November 7, Mr. Powell obtained for me a male Long-eared Owl on the Don Flats, Toronto; its stomach contained the remains of some field mice.

82. **Pinicola enucleator.**—Taken as follows:—At Rosedale, two males; crop and stomach of each were full of buds and ament scales of birch (*Betula popyracea*). January 25, by Mr. Powell, one male and three females; crops and stomachs contained the kernels of white ash (*Flaximes americana*), and the kernels of the berries of mountain ash (*Pyrus americana*), also a quantity of sharp sand. Mr. Mitchéll winged and brought home an adult male which is now (March 10), doing well in a cage. February 1, collected three females at Rosedale. March 1, a young male and a female secured for me on Don Flats.

83. **Acanthis linaria.**—Specimens of Redpoll taken November 9 and 16, 1889. They have been unusually numerous this fall about Toronto.

84. **Spinus pinus.**—Pine Siskins in large flocks feeding on birch trees in Rosedale, during November 1889, also observed October 12.

85. **Junco Hyemalis.**—On January 4, 1890, I procured two males in Rosedale; they were feeding on the seeds of *Amaranthus*. On February 1, I saw a flock of about fifty in the same place; believe that they wintered here this year in large numbers.

86. **Passerella iliaca.**—Fox Sparrow. On October 12, 1890, at Rosedale, shot two fine specimens of this rare sparrow, both males. On November 7, 1889, I took another at Dunbar's wood, Rosedale, Toronto. These are the only specimens I have seen of this beautiful sparrow and consider it very rare in this vicinity.—Daniel G. Cox.

87. **Pinicola enucleator &c., in University Grounds.**—This afternoon, Feb. 21, I saw a flock of Pine Grosbeaks in the University grounds feeding on seeds of the European Larch. They put themselves in all positions, sometimes hanging with their heads downward in order to get at them. I have shot five of these birds and four of them were feeding on these seeds. On February 12, I saw a flock of Redpolls (*Acanthis linaria*), feeding on seeds of *Chenopodium album* near the University. I procured three specimens. On February 13, I saw the flock at the same place again but not feeding. On February 26 I saw two female Pine Grosbeaks on College street, near the park; they were in a beach tree but were not feeding. They were very restless and only remained a few seconds and then flew off towards the north-west.

88. **Loxia leucoptera north of Toronto.**—On February 25, I received a pair of White Winged Crossbills from Mr. T. H. Irwin, of Sharon, who says he sees a flock of about twenty every day, eating seeds of spruce and tamarack. On March 10, I received another male of

the same species from the same place where they are still common.—C. E. PEARSON.

89. **Pinicola enucleator.**—Only a few of this species appeared here, most likely because there were no mountain ash berries left, the Robins (*Merula migratoria*) having cleared them all off before they left. The few Grosbeaks I saw were feeding on the buds of the larch.

90. **Sturnella magna wintering.**—I saw five Meadow Larks on January 30, and three on February 21.

91. **Ceryle alcyon wintering.**—I saw a Kingfisher here last January.

92. **Molothrus ater.**—Cowbirds observed in flocks at different times in January and February.

93. **Regulns satrapa.**—The Gold-crested Kinglet is not generally distributed in winter but found in sheltered hollows very often among hemlocks.

94. **Eider Ducks.**—Regarding the King Eider (*Somateria spectabilis*), I think we have all been astray about it. An Eider in immature plumage is a pretty regular visitor at Hamilton Bay. I described it in the "Birds of Ontario," as the Common one, but an examination of one I mounted long ago, as well as others obtained since, leads me to believe that they are all King Eiders in immature dress. Has the Common Eider (*S. dresseri*), ever been found with you?

95. **Ulula cinerea.**—Not a Grey Owl has been seen here this winter.

96. **Otocoris alpestris praticola.**—I first saw Shorelarks on February 10; though I believe a few winter with us. The true *Alpestris* I have not seen at all for several years.—THOMAS MCILWRAITH, Hamilton, Ontario.

97. **Merula migratoria wintering at Gravenhurst.**—Robins have also been with us, and a fine specimen was secured by Mr. Melville on January 4.—A. P. CORNELL, M.D., Gravenhurst, Ontario.

98. **Loxia leucoptera at Toronto.**—On March 9, while on Bathurst street, I saw some strange birds in McDonald's grounds feeding on the ground on seeds of the spruce cones which had fallen. On examination I found a flock of about twenty White-winged Crossbills. I fired at them but got none, and they flew off. On 10th, I went again and saw them, but they were so shy I could not get near them. To-day I went

over again and was fortunate enough to secure two specimens, one male and one female, the latter being alive. This is the first time I have seen the species in city since January, 1887, when I got three specimens out of a large flock which were in Rosedale ravine.—G. E. Atkinson.

99. After the reading of Reports, Mr. Thurston showed a young Coot (*Fulica americana*), taken in Toronto marsh, August 14, 1889, and called attention to the remarkable spur-like appendage of the alula.

(Sixth Meeting, March 25, 1890.)

100. **Lanius borealis at Scarboro'.**—On January 15, Mr. Horsey, of Scarboro', saw two Butcher-birds in his orchard. They had been there all winter, and were identified by him on that date.—W. Brodie.

101. **Lanius borealis killing Sparrows.**—On January 25, I saw two Butcher-birds attack and kill a Sparrow in my grounds at Claremont, Pickering township.—Dr. G. Brodie.

102. **Arrivals at Rouge Hill.**—*Merula migratoria*, *Sialia sialis*, and *Melospiza fasciata* arrived here on March 13.—M. Annis.

103. **Corvus americanus paired.**—I noticed that on March 12, Crows were paired and preparing for nesting about Toronto.—W. Brodie.

104. **Loxia leucoptera at Toronto.**—On March 16, I saw a flock of seven or eight White-winged Crossbills in the city.

105. **Merula migratoria around.**—Robin seen March 16, in the city; reported from Green River two weeks ago; in full song March 22. —Hubert H. Brown.

106. **Loxia leucoptera.**—On March 12, I received a pair of White-winged Crossbills that had been shot at Sharon on the 11th.

107. **Merula migratoria in Song.**—Heard Robin in song in the University grounds, March 19th.

108. **Melospiza fasciata.**—March 22, saw a male Song Sparrow in full song.

109. **Food, etc., of Otocoris alpestris praticola.**—Shot two male Shorelarks on the afternoon of March 22. Stomach of first contained seeds of *Amaranthus hybridus*, *Chenopodium album*, *Clover*, Pigeon weed and one oat; the other contained *Amaranthns*, *Chenopodium* and oat as before, a few grains of sand.

One Shorelark that I struck with my catapult fell, and after fluttering about, managed to rise and fly southward in a very erratic fashion; another, probably its mate, went after it and seemed trying to bring it again to the ground, by fluttering just in front and above it. They kept together like a pair of fighting Kingbirds, till lost to sight.—C. E. PEARSON, Toronto.

109. **Spring Notes.**—On March 20, near Lorne Park I saw a Red-headed Woodpecker (*Melanerpes erythrocephalus*). As it flew I noticed that the secondaries were marked also with a black spot or bar as in the immature birds. On March 15, I noticed a number of Shore-larks (*Otocoris alpestris praticola*), along the road in an open part of the country near Streetsville, where a pair of these species breeds every year. On March 19, as I passed I noticed a male in full plumage and song. No doubt he is mated and has eggs already. Is this the old bird of last year's pair, and if so where are the young nesting? Why not back to their native field?—ERNEST E. THOMPSON.

109. **Corvus americanus mobbing an Accipiter atracapillus.**—On Saturday, March 22, while collecting up the Don, I heard a great commotion among the Crows on a wooded hillside opposite my stand. On examining them through a glass I discovered that they were mobbing a hawk that seemed to be an immature Goshawk. I failed to get nearer or observe them more closely.—JAS. R. THURSTON.

110. **Lanius borealis.**—On February 22, I observed one Northern Shrike on the top of a maple tree in Leslie's nurseries, east of Toronto.—JOHN EDMONDS.

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1853.—**Allan, (Hon. G. W.)** The land birds wintering in the neighbourhood of Toronto. March, 1853. pp. 167-72.

An interesting paper containing notes on twenty-five species, including Quail, Spruce Partridge, Canadian Jay, etc.

1853.—**Whitwell (Rich.)** A "Rara Avis," June 15, 1853. p. 260.

On a *Merula migratoria* that wintered at Philipsburg (Ont.? or Quebec?)

1st Series, Vol. II., 1853-4.

1853.—**Couper (Wm.)** Red-breasted Thrush, Aug. 1853. p. 19.

Note on Mr. Whitwell's "Rara Avis." Somewhat aspersive of that writer's ornithological attainments, because he calls *Merula migratoria* "a Robin."

1853.—**Bechstein (T. M.) M. D.** Review of "Cage and Chamber Birds, by T. M. B.," December, 1853. p. 124. Reviewed by Prof. H. Y. Hind.

Interesting extracts on Red Crossbill in captivity.

1st Series, Vol. III., 1854-5.

1855.—**Hind (Prof. H. Y.), M.A., etc.** Egg of the Epyorius. April, 1855. p. 244.

Description of Egg from Madagascar.

1855.—**Cottle (J.)** Coccothraustes vespertina. Evening Grosbeak. July, 1855. p. 287.

Notes of the species at Woodstock, Ont., and description of habits and female plumage. May 7, (1855)?

1855.—**Lowe (E. J.)** Singular mortality among the Swallow tribe. Notice by Prof. H. Y. Hind. Nov., 1855. p. 388.

Mortality at end of May among *Hirundo rustica, H. urbica* and *H. riparia* in England, due to starvation.

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1856.—**Bovell (Jas.) M.D.** Freaks of nature on a game fowl, which on successive years was black, brown, white and speckled. June, 1856. pp. 75-6.

1856.—**Wilson (D.) LL.D.** Value of Natural History to the Archæologist, mentioning many birds and mammals that have been found in mounds, etc. *Gallus domesticus*, Gens Cinerea. Feby., 1856. pp. 191-2.

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1857.—**Hincks (Wm.) F.L.S.** Canadian Strigidae. Names and comments on eleven species in the Toronto University Museum. May, 1857. pp. 219-20.

1857.—**Bovell (Jas.) M.D.** The Canadian Humming Bird. Sept., 1857. pp. 382-3. Reference to Mr. John Gould's visit to Canada. His observations on *Trochilus colubris* also a mention of *Cariornis caboti.*

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1858.—**Hincks (Rev. Wm.) F.L.S., etc.** Review of Sclatin Geog. Distrib. of Aves. Sept., 1858. pp. 459-60.

1858.—**Wilson (Daniel) LL.D., etc.** Review of a Hand-book of Toronto, by a member of the press. Nov. 1858. pp. 502-9.

Contains interesting paragraphs on several of our common birds.

New Series, Vol. IV., 1859.

1859.—**Hincks (Wm.) F.L.S.** Review of the "Monograph of the Trochilidae," by John Gould, Jany., 1859. pp. 47-50.

1859.—**Cottle (T. J.) F.R.C.S.E.** Grus Americanus and Grus Canadensis; are they the same bird in different stages of growth? July, 1859. pp. 266-8.

Upholding their specific distinctness.

1859.—**Cottle, (T. J.) F.R.C.S.E.** Capture of two birds of unusual occurrence in Upper Canada. Sept. 1859. pp. 388-9. *Picus meridionalis* and *Ortygonietra jamaicencis.*

The first name is a mere synonym of *Picus* (now Dryobates) *pubescens.* The second item must stand as a good record of the occurrence of the *poranza jamaicensis* near Ingersoll, in 1857, "now in the collection of Wm. Pool, Esq."

1859.—**Hincks (Rev. Wm.) F.L.S.** The Family Falconidae. Nov., pp. 443-9.

A rambling essay. He claims "not less than fifteen species" for Canada, but adds little to our knowledge of them.

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1860.—**McIlwraith (Thos.)** List of Birds observed in the vicinity of Hamilton, C.W. Arranged after the system of Audubon. July, 1860. pp. 387-96.

An annotated list of 202 species, a work of sterling worth, of great value to science, and interesting as being the first good avifaunal list from Canada.

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1861.—**McIlwraith (Thos.)** Notices of Birds observed near Hamilton, C.W. Jany., 1861, pp. 6-18, and March, 1861, pp. 129-38.

A pleasantly written rambling article, that would have been of vastly more use had it been methodically treated.

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Note on Anas Glacialis in Tor. Univ. Mus. and another in Mus. of G. W. Allan. Refers to papers on Hybrid (Mareca penelope and Anas boschas) published in P. Z. S., 1861, by Alfred Newton, M.A.

1862.—**Hincks (Rev. Wm.) F.L.S.** Obs. * * on Sula bassana. * * at Oshawa, Ont., * * belonging to Mus. Univ., Toronto. July, 1862. pp. 329-336.

Contains little more than the title.

1862.—**Wilson (Daniel) LL.D.** Science in Rupert's Land. July, 1862. pp. 336-47.

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1862.—**Morris (Beverley R.) M.D.** On the power that certain water birds possess of remaining partially submerged in deep water. Nov., 1862. pp. 509-15.

1862.—**Hincks (Rev. Wm.) F.L.S.** Snowy Owl. Abundant at Toronto in winters of 1833, '37, '39 and '53. Nov., 1862. p. 522.

Letters appended from "Strix," and from S. Passmore.

1862.—**Taylor (F.)** Poisonous Partridges. Nov., 1862. pp. 523-4. On two persons poisoned by eating of Bonasæ, that had fed on certain berries.

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1863.—**Hincks (Rev. Wm.) F.L.S.** Nov., 1863. pp. 462-6. The Struthionidae. The extent and divisions of the Family with its systematic position and relations.

A dissertation on their taxonomic position.

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Third Series, Vol. III., 1886.

1886.—Allan (Hon. G. W.) Some of our Migratory Birds. Jany. 17, 1885. pp. 87-100.

A pleasanly written article of general treatment. He claims the Pine Finch (*Chrysomitris pinus*) as a summer resident in the neighborhood of Lake Simcoe, and also that the two Crossbills (*L. americana* and *L. leucopera*) "undoubtedly breed in the pine and hemlock woods (about Lake Simcoe,) and may be seen there all throughout the year.

Third Series, Vol. IV., 1887.

1887.—Williams (J. B.) Destruction of Wild Animals. March, 1886. pp. 142-6.

Third Series Vol. V., 1887.

1887.—Payne (F. F.) Mammals and Birds of Prince of Wales' Sound, Hudson Straits. 15th Jany., 1887. pp. 111-123.

A valuable paper with origiual observations on fourteen Mammals and twenty-six birds.

SUMMER SESSION, 1890, AT NIAGARA.

FIRST MEETING.

First Meeting in the Pavilion of the Queen's Royal Hotel, 2nd July, 1890, at 14 o'clock, the President in the chair.

The following papers were read :—

1. Curculionidæ of the Niagara District, by A. C. Billups, Esq., illustrated by a large collection of specimens.
2. Ignored Distinctions in Economics, by W. A. Douglass, B.A.
3. The Original Survey of Niagara Township, by William Canniff, M.D.
4. The proper use of the word "American," by J. P. Merritt, Esq.
5. Two Frontier Churches, by Miss Carnochan.

SECOND MEETING.

Second Meeting at the same place and date, at 20 o'clock, the President in the chair.

The following papers were read :

1. Weather Probabilities, by C. Carpmael, M.A.
2. The Making of Niagara, by William Kirby, Esq.
3. The Centenary of 1891, by O. A. Howland, Esq.

The following resolution was unanimously passed :

"That in the opinion of this meeting it is exceedingly desirable that the spots where the pioneers of Niagara lie buried should be carefully ascertained and definitely indicated by permanent marks ; that in the case of Col. Butler, the remains should be removed to the burial ground of St. Mark's Church, Niagara, where a tablet to his memory has for several years been placed ; and that this important and patriotic work should be undertaken and carried out by some local organization."

THIRD MEETING.

Third Meeting in the Pavilion of The Chautauqua Assembly, 3rd July, 1890, at 10 o'clock, Mr. Hamilton in the chair.

The following papers were read:

1. Niagara Falls in Literature, by A. F. Chamberlain, M.A.
2. The Hurons, by D. B. Read, Q.C.
3. Legislative Work of the First Parliament of Upper Canada (1792-95), by W. Houston, M.A.
4. Slavery in Canada, by J. C. Hamilton, LL.B.
5. Upper Canada in Peace and War, 1805 to 1815, by J. G. Ridout, Esq.
6. Archæological Remains; a factor in the study of History, by David Boyle, Ph. B.
7. Newark in 1792, by D. B. Read Q.C.
8. Diary of Governor Simcoe's Journey from York to Penetanguishene, 1794, by the late Hon. Alex. Macdonell communicated by Alex. Macdonell, Esq., of Osgoode Hall.

The following resolutions were passed unanimously.

1. That this meeting desires to place on record an expression of regret that Fort Mississauga and Fort George have been allowed to fall into a state of decay, which, if steps are not soon taken to preserve them, will result in their total destruction, and to urge upon the Dominion Government the desirability of taking prompt and effective action to preserve what remains of these interesting historical monuments; and that the Secretary of the Institute be instructed to send a copy of this resolution to the Minister of Militia of Canada.

2. That this meeting desires to express approbation of the patriotic sentiments in the paper of Mr. W. T. Kirby on "The Making of Niagara"; regrets, as does the writer, the great neglect of the study of Canadian history by our people; strongly urges that Canadian history be given a more important place in the school programmes and University curriculums in the different Provinces; and hopes that school histories may be prepared giving a comprehensive view of the Dominion, and at the same time having a more pronounced spirit of patriotism evident in them.

3. That the Members of the Canadian Institute hereby wish to express to The Chautauqua Assembly and the Town of Niagara, their gratitude for their kindness and hospitality in entertaining the Members during their summer outing, and that a copy of this resolution be transmitted to the Assembly and the Town.

ARCHÆOLOGICAL REMAINS, A FACTOR IN THE STUDY OF HISTORY.

By David Boyle.

Read at Niagara 3rd July, 1890.

When we compare the neoliths, the bronzes, the cromlechs, and the architectural ruins that afford material for archæological study in many other countries. both in the Old and New Worlds, with the "finds" that reward the student in Canada, it must be quite apparent that so far, at all events as variety and quality are concerned, the Canadian is at a considerable disadvantage. They too, as well as we, have palæoliths, while we can barely lay claim to having aught else.

I say "barely," because, although it is true that many of the aboriginal relics of this country are as ingeniously constructed, and as finely finished as are many of those belonging to the neolithic periods of Europe, they are found so intimately associated with the equivalents of old world palæoliths, that it has been found impossible to make here the distinctions that characterize European specimens.

Within the last few years discoveries of rudely worked flints have been made deep in gravel beds, by Dr. Abbott in New Jersey, and by others as far west as Ohio and Minnesota. The position of these weapons or implements favors the belief that man on this portion of the continent was contemporary with the glaciers by whose agency the gravel beds were deposited, and if this view is confirmed, it will be in order to distinguish the glacial from the more recent specimens by means of some such designations as are now applied to the relics of ancient man in the mother countries.

Up to the present time, however, there has been no well authenticated discovery of co-glacial relics in Ontario, or, so far as I am aware, in any part of the Dominion, and yet the probabilities are as strongly in favor of their being found here as in the places mentioned. But to revert to the comparison made with other countries, our disadvantage in the matter of quality and variety is fully compensated on other grounds. Here we are not only studying the life-history of those who ante-dated the arrival of the superior invading race, but of a people whose representatives came directly into contact with our own, scarcely less than four

hundred years ago, and what is more, of a people whose descendants, numbering many thousands, are still reckoned among our population.

As affording material for a chapter in the story of man's development these conditions have proved immensely valuable, notwithstanding that much yet demands careful and prolonged study before anything approaching correct solutions can be arrived at. In all that relates to existing tribes or families of Indians, much time and patient study have been devoted by individuals and by learned societies, more especially during the last half-century, and more particulary still, during the past twenty years by the American Bureau of Ethnology under the able directorship of Major J. W. Powell whose services cannot well be over-estimated in connection with the enormous mass of matter collected by himself and his staff of enthusiastic assitants, for the benefit of all who are interested (and who should not be?) in the cognate studies of archæology, mythology, and anthropology.

To many it seems little less than puerile that busy, practical, nineteenth century people should pay any attention to the fables and legends of the aborigines. In this connection Dr. Parkman says, "The fireside stories of every primitive people are faithful reflections of the form and coloring of the national mind; it is no proof of sound philosophy to turn with contempt from the study of a fairy tale. The legendary lore of the Iroquois, black as the midnight forests, awful in its gloomy strength, is but another manifestation of that spirit of mastery which uprooted whole tribes from the earth and deluged the wilderness with blood. The traditionary tales of the Algonquins wear a different aspect. The credulous circle around an Ojibwa lodge-fire listened to wild recitals of necromancy and witchcraft—men transformed to beasts, and beasts transformed to men, animated trees, and birds who spoke with human tongue. They heard of malignant sorcerers dwelling among the lovely islands of spell-bound lakes; of grisly *weendigoes*, and bloodless *geebi*; of evil *manitoes* lurking in the dens and fastnesses of the woods; of pigmy champions, diminutive in stature but mighty in soul, who by the potency of charm and talisman subdued the direst monsters of the waste; and of heroes, who not by downright force and open onset, but by subtle strategy, tricks or magic art, achieved marvellous triumphs over the brute force of their assailants. Sometimes the tale will breath a different spirit, and tell of orphan children abandoned in the heart of a hideous wilderness, beset with fiends and cannibals. Some enamoured maiden scornful of earthly suitors, plights her troth to the graceful manito of the grove; or bright aerial beings, dwellers of the sky, descend to tantalize the gaze of mortals with evanescent forms of loveliness."

In Ontario, the Indian is either so far advanced beyond the savage condition, or the modifying influence of white contact has been such as to render his recitals of traditions and folk-lore almost totally valueless, on account of the incredibly short time during which he absorbs unconsciously so much of what is purely Caucasian, and incorporates it with primitive legend. The Rev. John McLean who for ten years was a missionary among the Blood Indians in our North-West Territory informed me that when he resigned his mission at the end of the period named, he was able to observe a marked difference between the versions of the same story as told him at the beginning and end of his residence with these people. In the latter case many of the allusions were evidently tinctured with Christian doctrine and dogma, notwithstanding the stolid pagan character of those who recited the narratives.

It follows, therefore, that study and investigation along ethnological lines in this Province must be conducted mainly from the archæological point of view, unless, indeed, an exception be made in favor of philology —a field which has been pretty thoroughly worked in the older portions of the country and among the better known tribes, although, no doubt, much remains to be gleaned among those who reside north of the watershed that divides us from the Hudson Bay slope.

Fortunately for the archæological student (not the mere collector) material is not yet wanting in Ontario, although it is perfectly safe to say that hundreds of thousands of specimens have been carried off to find places in British and foreign museums.

Given the conditions necessary for aboriginal livelihood in any part of the province, and there it is almost a certainty that traces of ancient occupation will be found. The requirements were means of defence, proximity of water, light and easily turned soil, nut and fruit-bearing trees, and an abundanee of game.

Right here, and with narrow intervals all over this grand old Niagara peninsula which has been so appropriately named "The Garden of Canada," the Indian found as nearly a real earthly paradise as it was in the nature of aboriginal life to conceive. Every hill-top must have glowed with innumerable camp-fires, or have been set apart as a depository for the remains of departed braves. Every valley must have, times untold, re-echoed with the shout of the successful hunter, or the whoop of the vengeful warrior. Not a spring but has refreshed man, woman, and child of the dusky forest denizens, and not a foot of soil that has not yielded its root, or its fruit, or its bark, or its timber, for the nourishment and protection of those who little dreamed that ever the time would come when they would be dispossessed of their ancient heritage by a strange

and pale-faced people from the east, armed (if I may use the expression) with a bible in one hand, and a musket or a bottle of fire-water in the other.

The royal sturgeon of the big river, the maskalonge and lesser fish of the lakes, and the speckled trout of the small streams abundantly ministered to their wants. The soil in point of quality left nothing to be desired, and doubtless many a small clearing produced maize, and pumpkins for food, sun-flowers for oil, and tobacco for solace or ceremony.

Situated on a natural and comparatively narrow frontier, the Indians who inhabited this district were not slow to perceive the advantages as well as the disadvantages of their position. Their territory formed an immense middle ground between contending parties, east, north and south. With statesman-like diplomacy they refrained as much as possible from mixing themselves in these tribal wars, and, no doubt, profited by largesses from the opposing forces that had to traverse their country. It is uncertain how long they had maintained this attitude prior to the appearance of the French and English, but their position in this respect during the first half of the 17th century had gained for them the name of Neutrals.

It is inevitable that a people so circumstanced should have made considerable advance in rude mechanical art, and it is just as certain as anything can be that their relics have been turned up in large quantities during the clearing and cultivation of the farms for which Niagara district is famous, and yet, strange to say, there is scarcely any portion of old Ontario which is so poorly represented in the Provincial Archæological Museum.

True as are the remarks quoted relative to the value of primitive legends by way of enabling us to understand the modes of thought, manners of life, and conditions of early society, it may safely be asserted that even more may be learned from a close and patient study of such utensils, implements and weapons as we find to-day on the sites of ancient villages and kitchen-middens, or scattered about as they have been lost in the chase or on the battle-ground.

A comparison of American with European relics while exhibiting many points of resemblance, brings out also a very large number of divergencies. The hornstone celt and the flint arrow, or their equivalents in other material were coincident with primitive man in every part of the world, but, besides these, there are forms peculiar to certain large areas, and not seldom, to districts of comparatively limited extent.

To learn the uses of these is to arrive at a knowledge, not only of how

the ancient people lived, but of how they thought which is of even greater importance, for if we can ascertain this we are on the highway to an understanding of much that it would be extremely interesting to know relative to aboriginal mental development, and consequently valuable as a contribution to the history of our race in its progress from the rudest to the highest and most refined manifestations of humanity.

The larger and more varied a collection of such objects is, the better are the opportunities for study and comparison. In aboriginal workmanship no two objects intended to serve the same purpose are identical, and it may be that a slight peculiarity in the form of one in a score or in a hundred will prove suggestive of the application of the whole group.

The Canadian Institute has succeeded in bringing together what I think it is safe to say is the largest collection in the world, of such objects as are illustrative of pre-historic life in what is now the province of Ontario.

Natural, however, as it may be to suppose that in any circumstances this should be the case, I wish to take this opportunity to state, that but for the assistance rendered to the project by a small annual grant from the Provincial Government during the last four years, the Archæological, Museum of Ontario would scarcely have been worthy of the name, and the six or seven thousand valuable specimens now in its cases would have remained scattered throughout the country either buried in the soil or if in the hands of private collectors, to be of little use scientifically and in not a few cases ultimately lost. Its reputation as an established institution is now so good that during the last half-year, three private collections have been placed in our rooms on permanent exhibition. These collections number respectively, 600, 150, and 450 specimens or a total of 1,200, to which if there are added at least 300 as the result of search on behalf of the Institute, we have increased the number this year by 1,500

As I have already intimated, the Niagara peninsula is but scantily represented—the northern side of it hardly at all, and I am sure it is perfectly needless for me to say how much pleasure it will afford the Institute to receive from residents in this locality any archæological information or material connected with the Attiwandarons who were here when Hennepin and La Salle landed, on their way to the upper lakes in 1678, and who had probably occupied the same ground for centuries previous to that time.

NEWARK IN 1792.

By D. B. Read, Q.C.

(*Read 3rd July, 1890.*)

Newark, the first capital of the Province of Upper Canada, had but a brief existence under its English name, and then relapsed into the Indian name of Niagara. Its successor, York, had a similar experience. After sporting for a time the Royal name of York, it too, after a time, fell back to its old Indian name of Toronto. The first place in which we find Newark named in the old Records is in the Crown Lands office at the capital of the Province. There will be found there an old map made by Acting Surveyor-General D. W. Smith in 1794, in which is set apart the Town Plot of Newark. Newark had its name from Newark, a borough and market-town in Nottinghamshire, England, in which market-town are the ruins of a fine castle built in Stephen's reign, and dismantled in the Cromwellian period.

In 1789, Newark was called Niagara, the name it bears to-day. In the early history of the Province, indeed before Upper Canada and Lower Canada were formed into separate Provinces, there was a Land Board formed principally for the purpose of allotting to the original settlers the land to which they were entitled by virtue of the instructions issued by the King to Lord Dorchester in 1783—the parties entitled to lands being officers, non-commissioned officers, privates and others who adhered to the King's cause during the Revolutionary war. This Land Board, it is recorded at the Crown Land office, met at Niagara (not Newark) on the 26th October, 1789. There were present, Lt.-Col. Harris, Lt.-Col. Butler and R. Hamilton. The Board took into consideration the King's commands, and determined what number of acres each of the above named class of persons should receive for their services during the Revolution, and awarded to loyalists who were non-combatants a quota of the land set apart by the King; each head of a family securing fifty acres for himself and fifty acres for each of his children. Mr. Surveyor-General Smith's Report of 1789 is very interesting reading at the present day, as in that report we come across so many names familiar to Canadian ears. It was perhaps a fortunate thing that Lt.-Col. Butler of Butler's Rangers, should have complained to the Governor that certain of the original settlers were trespassing on his lands. This complaint caused

enquiry, and the Report to which I have referred. In that Report we find the name of Secord, Servos, Ball, Lt.-Col. John Butler, Mr. Bradt and others, all of whom had lands just west of the Town Plot of Newark, between the two-mile and the four-mile creek, or as called on the map, between the two-mile and four-mile pond. It is not generally known that Newark was at one time called Lennox. D. W. Smith, in 1794, about the time that the public offices in Newark were being removed to York, thought it proper that he should make a table of distances of places, and other matters, for use in the Crown Land office. It s stated in this table that " Newark, formerly called Lennox, is situated on the west side of the entrance of Niagara River, opposite to the fortress at Niagara on Lake Ontario. This town was laid out in the year 1791, and the buildings were commenced upon the arrival of His Excellency Lt.-Governor Major-General Simcoe in 1792. It contains now (1794) about 150 houses—the gaol and Court House for the Home District were erected in this place by an Act of the Provincial Legislature in their first session—the Courts of the General Quarter Sessions of the Peace are holden here. The Court of King's Bench sits here. The first Provincial Parliament met at this place, and the public offices of Government have been held *pro tempore* here. Navy Hall, which is situated on the west bank of the river, a little above the town, is the residence of the Lt.-Governor during his stay at this place. The Council House is about half-way between the town and Navy Hall." It will be noticed that Mr. Smith states that in 1794 there were 150 houses in Newark. Then how many were there in 1792? Dr. Withrow, in his history, gives the number at that date to have been about one hundred.

Mr. Isaac Weld, in his travels in America, A.D. 1795-1797, gives a very complete description of Newark as it appeared to him at that time, and there is no reason to believe that it was different in 1792, except as to the number of the people in the town, and the number and class of buildings erected since 1792. Mr. Weld, after describing his trip across Lake Ontario, says :—" The Town of Newark is built parallel to the river. From the deck of our vessel anchored two miles out it could scarcely be seen. Except a few shabby houses at the nearest end, it makes a very fine appearance. We landed at Mississaga Point, from whence there is an agreeable walk of one mile, partly through woods, to the Town of Niagara. The Town of Niagara, contains about seventy houses, a Court House, gaol aud building intended for the accommodation of the Legislative bodies. The houses, with few exceptions, are of wood—those next the lake are poor, but at the upper end of the town there are several very excellent buildings, inhabited by the several principal officers of the Government. Most of the gentlemen in official stations in Upper Canada are Englishmen of education, which renders the society agreeable. Few

places in North America can boast of a more rapid rise than the little Town of Niagara, nearly every one of its houses having been built during the last five years . . . . land has risen 50 per cent. in three years. . . . On the margin of the Niagara River, about three-quarters of a mile from the town, stands a building called Navy Hall, erected for the accommodation of the naval officers on the lake during the winter, and also to facilitate the landing of merchandize when the navigation is open. Navy Hall is now occupied by the troops, the fort on the opposite side having been delivered up to the Americans."

The visit of Mr. Weld to Newark or Niagara (I say Newark or Niagara as he uses the name interchangeably to signify the same place), was in 1797. It will be observed he makes the statement that at that time there were about seventy houses in the place, while Dr. Withrow states that there were about one hundred houses in 1792. Dr. Withrow is more nearly correct as evidenced by the statement of D. W. Smith, made in 1794, in which he says there were then one hundred and fifty houses in the town —the population was therefore, according to ordinary estimates, 500 in A.D. 1792 and 750 in A.D. 1794. Who made up this population? We have historical facts to establish that immediately after the Treaty of Peace between England and her revolted colonies, now the United States, United Empire Loyalists came into this Province in large numbers, and Major General Simcoe, the Governor, immediately on receiving his appointment as Governor, issued a proclamation inviting settlers, and threw open the Crown lands for their benefit. Led by Mr. Berczy, a band of German colonists, from New York, came over, and were the precursors of thousands who followed them to different parts of the Province. "Across the Niagara River (says Professor Bryce) came convoys of emigrant waggons, herds of cattle, household goods, to receive a welcome to the Niagara or London Peninsula, or the district around Toronto. In the early settlement a large per centage of the immigrants were military. The Niagara frontier was peopled by Butler's men. . . ." Again he says, "Two ships guarded by the brig "Hope," and laden with Loyalists left New York harbour in 1783, and landed at Sorel in Lower Canada. To Sorel also came a number down the old Military road, along the Richelieu—soldiers and disbanded Royalist regiments—and settled the country in the next year (1784) from Glengarry to the Bay of Quinte. The Niagara frontier at the same time was lined with the desperate Butler's Rangers. Loyalist Districts extended even to Detroit, along Lake Erie. Ten thousand Loyalists, men and women, of determination and principle, thus peopled and gave tone to what is now the Province of Ontario. In 1792 there were 12,000 settlers in the Province."

In the Life of the late William Hamilton Merritt, the projector of the Welland Canal and United Empire Loyalist, we find it stated that his father came into Upper Canada from New York State in 1796, and that at that time the lands of the Niagara District had all been taken up by the men of Butler's Rangers, that the frontier being settled he was forced to take up land on the twelve-mile creek.

From all this it is pretty plain to be seen how Newark or Niagara had a population of at least five hundred souls in 1792.

Major General Simcoe, the commander of the Simcoe Rangers throughout the Revolutionary war, when he took up the reins of government in the Province, found himself among his own people, who looked upon him as an elder brother.

This paper would not be complete without a fuller statement of what took place at Newark on the occasion of the opening of the first session of the First Parliament of Upper Canada, of which General Simcoe was executive head, in 1792. It has been stated, on the authority of Mr. Surveyor-General Smith, that the Council House was on the hill between Navy Hall and the Town of Newark. It would thus be found to be in the Military Reservation. There is every reason to believe that the Council House mentioned by Mr. Smith was the place of meeting of the Legislative Council of the Province. There is a kind of unauthenticated tradition that the first Legislature met under a tree. It is more probable that the members sent to the first Assembly met the Governor at his headquarters, Navy Hall, and having organized, were summoned to attend His Excellency in the Council Chamber to hear the speech from the throne. It is an historical fact that at the opening of the House soldiers were drawn from Fort Niagara on the opposite side of the river (still retained by the British, as a hostage for the due performance of the terms of the Treaty of 1783 by the Americans) to act as a guard of honor to His Excellency, and to accompany him to the Council House to listen to his speech to be addressed to Parliament. It is not impossible that the members may in the first instance have met together under a tree, and then it being announced to them that the Governor was ready to receive the people's representatives proceeded from thence to the Council Chamber. It has been the custom for nearly a century of our existence as a separate Province for the Governor to address the Legislative Council and the Commons in the Legislative Council Chamber. The Constitutional Act of 1791 entitled the Province to send fifteen members to the Legislative Assembly—of the fifteen returned to the first Assembly only seven were present at the opening of the House, and about as many Legis-

lative Councillors. It may be safely affirmed that at the first opening the Governor had not a very full house. This conscientious Governor, like a conscientious actor, was not to be daunted by the slim attendance.

Governor Simcoe was ever careful to respect the formalities which threw a halo around the British throne. In military uniform, attended by his staff, he proceeded to the Council Chamber, and there met the Council and people's representatives in Parliament assembled. It is not necessary to give the speech here, as it has been elsewhere published. It may, however, be stated that it was a speech abounding in patriotic sentiments and devotion to the Crown and Constitution of England.

I will not tire my hearers by prolonging this paper to greater length, but will conclude by saying that I join with them in felicitations at the happy circumstance of this meeting at Chautauqua, in the vicinity of the old Town of Newark, Navy Hall and Fort George, all historic spots in a Province, blessed by Providence beyond measure, and which had for its first Governor Major General John Graves Simcoe, whose memory will be perpetuated for all time in the annals of the country.

THE LEGISLATIVE WORK OF THE FIRST PARLIAMENT OF UPPER CANADA (1792-95).

By William Houston, M.A.

(Read 3rd July, 1890.)

The work of the first Upper Canadian Parliament cannot be clearly understood without a preliminary survey of the events which led to the establishment of the Province of Upper Canada in 1791. A vast but indefinite extent of territory was surrendered by the French Governor to General Amherst at the capitulation of Montreal in 1760, and this surrender was confirmed by the Treaty of Paris in 1763. The boundaries of the surrendered territory were not defined either in the Articles of Capitulation or in the Treaty of Paris, but the conquered country was regarded in a vague way as extending westward to the Mississippi and northward to the southern limit of the territory covered by the Hudson Bay Company's Charter. The most easterly part of this vast region was erected into the "Province of Quebec" by the Royal proclamation of 1763, with an area not greatly different from the area of the same Province to-day, the south-westerly limit being a line drawn from Lake Nipissing to Lake Champlain. The Proclamation did not provide any machinery for the government of the new Province, which, with the rest of the surrendered territory, had been administered for three years under military law. Civil government was established by the issue of a commission to General Murray as Governor of Quebec in 1764, the appointment of a small advisory council, and the appointment of a Chief Justice and other civil officials.

For eleven years the Government of Quebec retained this rudimentary form, but in 1774 the British Parliament, prompted partly by the demands of the people of Quebec for a more regular form of government, partly by the requests of the residents in the distant French settlements for protection, and partly by the desire of preventing the Canadians generally from joining in the then rising revolutionary movement of the English colonists, passed the Quebec Act. This statute enlarged the Province by extending it westward to the Mississippi, and southward to the Ohio, secured the French Catholic clergy in the enjoyment of their "accustomed dues and rights," established "Canadian law" as the rule of decision in all controversies respecting property and civil rights, and created a legislative body,

the members of which were to be appointed by the Governor from amongst the British and French citizens of the colony. The passage of this Act had probably the effect of hastening the American revolution, and it had certainly the effect of preventing the French people from casting their lot in with the revolutionists. In 1776 the Declaration of Independence was signed, and in 1783 Great Britain, by the Treaty of Paris, acknowledged the independence of the revolted colonies as the "United States of America."

The "United Empire Loyalists"—those who had stood by the King of Great Britain during the revolutionary war—in some cases from choice, in other cases to escape persecution, emigrated from the adjacent States to various parts of what is now the Dominion of Canada—Nova Scotia, New Brunswick, Quebec, and Ontario. In the last named Province they "squatted" along the St. Lawrence between Kingston and Montreal, along the north shore of the eastern part of Lake Ontario, about the Bay of Quinte, and in the Niagara Peninsula. Niagara had for them special attractions, inasmuch as it was comparatively near and well known, naturally adapted for agricultural life, and protected against Indian depredations by Fort Niagara, which remained in the hands of the British authorities till the negotiation of the Jay Treaty in 1796. During the seven years, from 1783 to 1790, the population of the western part of the Province of Quebec, as defined by the Act of 1794, increased with rapidity, owing to the immigration of these English-speaking exiles, and it soon became evident that the primitive constitution provided by the Quebec Act would have to be changed in conformity with the altered conditions. The Constitutional Act, which was passed by the British Parliament in 1791, divided Quebec into Upper and Lower Canada, the line of division being in part the Ottawa River, and in part a line from the Ottawa to the St. Lawrence along the western limit of the most westerly of the French seigniories. Each of these Provinces was furnished with a Parliament of its own, and each Parliament consisted of a Governor, a Legislative Council, whose members were appointed by the Crown, and a Legislative Assembly, whose members were elected under a very restricted franchise.

It should be borne in mind that though the "United Empire Loyalists" had opposed their fellow colonists in the attempt to assert their independence of Great Britain, they had long been accustomed to a system of Government under which they made their own laws in all important matters, and administered for the most part their own affairs of state. The thirteen colonies had all been provided with legislatures for a longer or a shorter period—some of them for over a century—and had enjoyed a degree of political freedom which left nothing to be desired until the unfortunate attempts of the British Parliament to collect an Imperial tax between 1764

and 1774. In spite of their adhesion to the Royal cause, the "Loyalists" were of a robust political temperament, and the appointed "Legislative Council," which they found sitting in distant Quebec, was a poor substitute both theoretically and practically for the legislative machinery to which they had been accustomed. Their feelings in this matter were shared by the immigrants from Britain, who were familiar with representative parliamentary government there. Both classes of the new community were further accustomed to the common law of England, to free and common soccage tenure of land, and to the exercise of local self government through the medium of municipal machinery, however imperfect. The settlers in Western Canada were at once distant from Quebec and close to the United States, far from their own seat of government and near a people whom they regarded as their bitterest enemies. From every point of view the system of government under which they found themselves was unsuited to their needs and peculiarities, and from knowing what these were one might almost predict without actual acquaintance with the work of the first Upper Canadian Parliament what that work would be like.

Nor should it be forgotten that under the new system introduced in 1791 the offices of Governor and Chief Justice were of the very greatest importance. The occupant of the former acted then on his own personal responsibility as an Imperial officer, having no ministry, as colonial governors now have, responsible to Parliament for the advice they gave. He wrote his own speeches to be read from the throne, and in this and other ways intimated his own wishes and propounded his own policy to the Houses of Parliament. The first Governor of Upper Canada, John Graves Simcoe, had been a British officer during the Revolutionary war, and he came to the discharge of his duties with a high sense of the dignity of his position and of the political value of the British Parliamentary system. In the first Chief Justice, Sir William Osgoode, he had an able coadjutor and a cordial sympathiser. Behind or beneath a somewhat amusing assumption of vice-regal and judicial formality there can be little donbt that there existed among the various parties to the work of legislation a certain frank familiarity which made it possible for all, untrammelled by partisanship, to bring to bear on that work the most earnest consideration, the most assiduous effort, and the most disinterested desire to promote the common good.

The first Parliament of Upper Canada met at Newark, now Niagara, on the 17th of September, 1792. It continued its meetings at the same place for four sessions, the last being held in 1795. The first session of the second Parliament was held at Newark in 1796, and the second session at York, now Toronto, in 1797. It is impossible now to say, with certainty, in what building the first Parliament met, but the weight of local tradition

seems to make it probable that for some time the sessions were held in the old Indian Council House, the site of which is still pointed out on the Garrison Common to the south-west of the town of Niagara.

Perhaps the most convenient way of getting a view of the legislation of the first Parliament during its five sessions will be to classify the statutes passed according to the subjects with which they deal, and for this purpose the following heads will suffice: (1) Administration of Justice, (2) Municipal Affairs, (3) Militia and Defence, (4) the Status of Special Classes of Persons, and (5) the Work of Legislation and Administration.

I. ADMINISTRATION OF JUSTICE.

It has already been intimated that the discontent of the English-speaking immigrants, whether from the United States or Great Britain, with French Canadian law, was one of the reasons for the passage of the Constitutional Act of 1791, and the division of Quebec into Upper and Lower Canada. It is not surprising, therefore, that the first Act passed by the first Upper Canadian Parliament, at its first session was "An Act to Repeal certain parts" of the Quebec Act of 1774, "and to introduce the English law as the rule of decision in all matters of controversy relative to property and civil rights." The preamble to this statute gives as a reason for enacting it that "the part of the late Province of Quebec now comprehended within the Province of Upper Canada has become inhabited principally by British subjects, born and educated where the English laws were established, and who are unaccustomed to the laws of Canada;" and one section of the Act provides that "all matters relative to testimony and legal proof in the investigation of fact, and the forms therof, in the several courts of law and equity within this Province be regulated by the rules of evidence established in England." The second Act passed during this first session was one to establish trial by jury, in strict accord with the law and custom of England. The effort to work the system of trial by jury in the French colony to the east had proved unsatisfactory, and in 1774 it had been abandoned in civil cases. During the same session an Act was passed "to abolish the summary jurisdiction of the Court of Common Pleas in actions under ten pounds sterling," and another "for the more easy and speedy recovery of small debts," by means of local tribunals, each made up of two or more justices of the peace and designated a "Court of Requests." And, still during the same session, an Act was passed to provide for the erection of a jail and courthouse in each of the four districts into which the Province was then divided—Eastern, Midland, Home, and Western.

In the second session the times and places of the meetings of the quarter sessions of the justices were fixed by statute, and a probate and a surrogate court were established in each district.

In the third session amendments were made in the statutes respecting juries, and jails and courthouses; district courts were established for the "cognizance of small causes," the lower and upper limits being forty shillings and fifteen pounds; and the Court of King's Bench, with powers similar to the Court of the same name in England, was created as a "Superior Court of Civil and Criminal Jurisdiction," an appeal in suits involving sums of more than one hundred pounds being allowed to the Governor and two or more members of his Executive Council, sitting as a Court of Appeal.

All the other statutes dealing with the working of the legal system of the Province that were passed during the remainder of the Parliamentary term were Acts amending previous statutes, except one to provide for the registering of deeds, conveyances, wills, "and other incumbrances" affecting real property.

II. MUNICIPAL AFFAIRS.

Nothing could show more clearly than the statutes passed by the first Parliament of Upper Canada to regulate those affairs now ordinarily termed "municipal," the fact that it drew its inspiration largely from the U. E. Loyalist immigrants, who were accustomed to free municipal institutions in their former homes. During the first session very little was done in this direction except to authorize the justices of each district to make what regulations they pleased for the prevention of accidents by fire, and to appoint officers to enforce them; but in the second session an Act was passed "to provide for the appointment of parish and town officers" within the Province, and by "town" here is meant what we now call a "township." This statute is of great historical importance in relation to the municipal system of Ontario, and, therefore, a brief summary of its provisions may be useful here. It provided that in each township which had "thirty or more inhabitant householders," any two justices of the district might order the constable to call a public meeting of the householders of the township on the first Monday in March for the purpose of electing a town clerk, two assessors, one collector of taxes, not more than six overseers of highways who should also serve as fence-viewers, a pound-keeper, and two church wardens. The statute defines the duties of these various officers, and also provides that in the event of a refusal on the part of any of those so elected to serve, any two justices might elect others to fill the vacant offices till the next town meeting. The "inhabitant house-

holders" in public assembly were not authorized to impose taxes—that would be done in those days only by Act of Parliament—but they had the right by resolution to "determine upon the height or sufficiency of any fence or fences" within the township. There can be no mistake as to the source from which the idea of this primitive municipal system came; the Upper Canadian "town meeting" was simply an adaptation of the "town meeting" of New England, modified by the omission of some of the more democratic prerogatives of the latter and by the addition of special features that were probably imported direct from Great Britain.

During the same session two other municipal statutes of importance were passed, one regulating "the laying out, amending and keeping in repair the public highways and roads," and the other authorizing "the levying and collecting of assessments and rates in every district." Some of the provisions of the latter statute are sufficiently interesting to merit notice. The assessors of each township were required to arrange all the "inhabitant householders" in eight classes, according to the amount of their real and personal property, from fifty pounds upwards, and to make out a tax roll, one copy of which was to be signed by two justices and affixed to the church door or some other place of public resort, while another was to be delivered to the town clerk. The rate of taxation was two shillings and six pence a year for each fifty pounds of assessment, and this was to be paid by the collectors of townships to the treasurer appointed by the justices in session for the district to which they belonged, and to be paid out by him on the order of the same justices under statutory authority. The various services to which these funds might be devoted were, according to the preamble to the statute, building and repairing a courthouse and jail, paying the jailer's salary, maintaining the prisoners, building and repairing houses of correction, constructing and repairing bridges, paying the fees of coroners and other officers, destroying bears and wolves, and paying members of Parliament "wages," not to exceed ten shillings a day for the period of their actual attendance.

Statutes were subsequently passed by the first Parliament amending those already referred to, and during its third session it undertook to deal with the still vexed question, the regulation of the retail traffic in spirituous liquors. The ordinance passed by the Legislative Council under the authority of the Quebec Act of 1774 was repealed as "inconvenient," and the granting of licenses to sell intoxicating drink was vested in the justices of the district, who were authorized to determine the number of licenses to be granted, and also to decide as to whether the applicant for a license was "a sober, honest and diligent man, and a good subject of our Lord the King." The evidence on which the latter point was to be decided was

"a testimonial under the hands of the parson and church or town wardens, or of four reputable and substantial householders, setting forth that such person is of good fame, sober life and conversation, and that he has taken the oath of allegiance to our Sovereign Lord the King."

III. MILITIA AND DEFENCE.

The Treaty of Paris, 1783, did not immediately reduce to a state of peace the Niagara frontier on either side of the river. Fort Niagara remained, as did also Forts Detroit and Michillimackinac, in the hands of the British for a period of thirteen years. The Indians on both sides of the frontier were in a chronically perturbed condition, and there was constant danger of a serious if not a prolonged border war, with both whites and Indians taking part in it. In this state of affairs Governor Simcoe naturally desired that the people of Upper Canada should put themselves in readiness for an organized defence of their territory against invasion, and at his instance one Act was passed in the second, and another in the third session of the first Parliament. How far the measures thus taken might have served the intended purpose had any invasion taken place must be left to conjecture, for all danger of immediate trouble was removed by the Jay Treaty of 1796, which secured the final withdrawal of the British troops from the forts on the United States side.

IV. STATUS OF SPECIAL CLASSES OF PERSONS.

In 1790 the British Parliament, actuated, no doubt, by a desire to facilitate the migration of United Empire Loyalists from the United States to Canada, passed an Act permitting them to bring with them their negro slaves under authority of a license granted for that purpose by the Governors of Provinces. A considerable number of slaves were imported into Canada between 1790 and 1793, but in the latter year a statute was passed by the Legislature of Upper Canada, during its second session, "to prevent the further introduction of slaves and to limit the term of contracts for servitude within the Province." The preamble to this Act recites that "it is unjust that a people who enjoy freedom by law should encourage the introduction of slaves," and declares that it is "highly expedient to abolish slavery." The statute itself enacted that no more licenses should be granted for the importation of persons destined to slavery, that all persons previously held in slavery elsewhere should, after the passage of the Act, be free on arrival in Upper Canada, and that no contract for voluntary servitude should be made for a longer time than nine years. It further provided that while slaves already in the Province should be left in slavery, every

child born of slave parents after the passing of the Act, should be free at twenty-five, and that the children of those who were thus temporarily slaves should be free from birth. The effect of this law was first to prevent the spread of slavery and secondly to bring about its gradual extinction.

During the same session an Act was passed "to confirm and make valid certain marriages" which had been contracted irregularly on account of the absence of a Protestant clergy, "and to provide for the future solemnization of marriage in the Province." Besides confirming marriages "publicly contracted before any magistrate or commanding officer of a post, or adjutant, or surgeon of a regiment acting as chaplain, or any other person in any public office or employment" before the passing of the Act, the statute provided a method of attestation and registration of marriages and births well calculated to remove all uncertainty as to the legitimacy of the children born of such irregular marriages. For the future all marriage ceremonies were to be performed by "Parsons of the Church of England," except when the parties were as much as eighteen miles from the nearest one, in which case they might call in the services of a justice of the peace. The illiberality of this provision was quite in keeping with the provision made in the Constitutional Act, 1791, for the establishment and endowment of a Protestant Church. It required nearly half a century of agitation to secure for the clergy of other denominations the right to perform the marriage ceremony.

During the third session an Act was passed "to authorize the Governor to license practitioners in the law." It suspended for two years the operation of an ordinance of the Legislative Council of Quebec and substituted for its provisions a simple method of licensing by the Governor, the number of practitioners so licensed to be limited to sixteen. Disbarring was provided as the penalty for "malversation or corrupt practice." The license fee was fixed at forty shillings and the registration fee at thirteen shillings and four pence.

During the fourth session an Act was passed "to regulate the practice of physic and surgery." This does not call for any special remark, except that it was the first of a long series of legislative attempts to confine the art of healing to regular practitioners.

V. LEGISLATION AND ADMINISTRATION.

During the second session of the Legislature an Act was passed which provided that "members of the House of Assembly be allowed wages for their attendance thereat, not exceeding ten shillings a day." Another was passed to provide means "for the payment of the salaries of the officers of the Legislative Council and the House of Assembly, and for defraying the

contingent expenses thereof." The fund to be used for this purpose was created by the imposition of "a duty of twenty shillings, to be levied on all licenses for the retail of wines or spirituous liquors," in addition to the one pound sixteen shillings already mentioned as the license fee.

During the third session an Act was passed to provide that all moneys paid into the Provincial Treasury on account of fines, forfeitures and penalties should be "accounted for" to the King as he might direct. By an Act passed in the same session a duty was levied on "stills," thus laying the foundation of that very important source of income, the inland revenue tax.

During the fourth session, in view of the then approaching election, an Act was passed "to ascertain the eligibility of persons to be returned to the House of Assembly." This also was the first of a long series of enactments which were subsequently passed with a similar purpose in view.

THE HURONS.

BY D. B. READ, Q. C.

(*Read 3rd July. 1890.*)

The very able Report of the Canadian Institute, made in the Session of 1888-1889, in which Mr. David Boyle, Curator of the Institute, has given an interesting and instructive account of the archæology of that part of the Province of Ontario in the neighbourhood of Lake Huron, suggested to my mind the opportuneness of the present occasion for drawing attention to the *history* of that great Indian Nation after whom Lake Huron is named. What fitter place to discuss this question than on the margin of Huron's sister Lake, Ontario, in Indian, "Skandario,"—in English, "the beautiful lake?"

Like Ontario, Huron in the 17th century, had another Indian name. On Sanson's map, 1656, Lake Huron is called "Lake Karegnondi." In the same map, Lake Michigan is called "Lac-de-Puans."

The Huron nation which occupied all the territory forming the Peninsula between Lake Ontario and Lakes Huron and Erie was a nation within a nation. The great Algonquin family of Abenaquis claimed all the territory extending from the St. Lawrence to the Rocky Mountains. Mr. Schoolcraft, the distinguished American ethnologist, has classified the North American Indians as follows:—1st, Northern, extending from the Atlantic to the Pacific Ocean. 2nd, East of the Mississippi and the Rocky Mountains. 3rd, West of the Mississippi and Rocky Mountains. 4th, West of the Rocky Mountains. These embrace altogether thirty-seven families under which there are numerous sub-divisions. He gives the name of the Iroquois as one of the sub-divisions, but does not name the Hurons, which goes to establish that he considered the Hurons as a branch of the Iroquois.

Parkman, after stating that the Algonquin population extended from Hudson's Bay on the north to the Carolinas on the south, and that the Iroquois family was confined to the region south of the Lakes Erie and Ontario, forming as it were an island in the vast expanse of Algonquin population, goes on to say, "Of all the members of the Algonquin family, those called by the English the Delawares, by the French the Loups, and by themselves, 'Lenni Lenapé,' or *original man*, hold the first claim to

attention; for their traditions declare them to be the parent stem, whence other Algonquin tribes have sprung. The latter recognized the claim and at all solemn councils, accorded to the ancestral tribe the title of Grandfather." Mr. Parkman subjoins this note, "The Lenapé, on their part, called all the other Algonquin tribes children, nephews or young brothers, but they confess the superiority of the Wyandotts (Hurons), and the five nations, by yielding them the title of Uncles. They in return call the Lenapé, nephews, or more frequently cousins. This confession proves the antiquity of the Iroquois and Huron families of Indians: that indeed they date back to the earliest ages and were the ancestors of the Algonquins, who greeted Jacques Cartier on his arriving at the Indian village, now the site of the city of Montreal, on the 2nd October, 1535.

The Jesuits styled the country of the Hurons around Lake Huron, "the granary of the Algonquins."

The Indians who met Cartier on his arrival at Hochelaga or Montreal, in 1535, were doubtless Indians of the Huron Iroquois family. Faillon (Histoire de la Colonie Française) says he believes that the Indians found on the St. Lawrence were Iroquois, who were succeeded in Champlain's time by Algonquins. Cartier found Hochelaga to be a village of some magnitude and well fortified with palisades and other means of defence. When he arrived there, one hundred Indians came down from their bark houses to the shore to meet him, which they did in the most friendly manner. This may be ascribed to the fact that the Indians of Hochelaga seemed to recognize Taignoagny and Donnagaya, the two natives that Cartier had captured at Gaspé in 1534, on the occasion of his first voyage to America, and had now with him as interpreters—or it may have been from the desire of the Abenaquis to get up a trade with the white men. The question, however, is, were these Abenaquis, Huron or Iroquois-Huron Indians? Before reading Mr. Joseph Pope's admirable essay on "Jacques Cartier, his life and voyages," written in competition for a prize offered by His Honour the Lieutenant Governor of the Province of Quebec, offered through the Literary and Historical Committee of the "Cercle Catholique" of Quebec, and for which essay Mr. Pope received first prize, I had come to the conclusion in my own mind that these Hochelaga Indians were Hurons or Iroquois-Hurons. Mr. Pope's essay of 1889, now published in the form of a book, justifies me in this opinion. Mr. Pope writes, "The description which Cartier gives us of the fortifications of Hochelaga and of the structure of the houses, closely resembles that recorded by the Jesuit missionaries among the Iroquois a hundred years later, and leaves little room to doubt that the people he found there belonged to the Huron-Iroquois family. The method of fortification he describes was

that practised by all the tribes of the Iroquois race. The Algonquins, on the other hand, did not employ this means of defence." Mr. Pope says further, "There are likewise strong grounds for thinking that the people of Stadaconé (Quebec) were also of Huron-Iroquois lineage. In the first place there is every likelihood that they spoke the same language as did the people of Hochelaga. We have seen how at Gaspé, Cartier was quick to notice and record the difference in habits and in language between the Indians he met there and those he had before encountered. But at Hochelaga, he says nothing which would lead us to suppose that the Indians he there found differed in any essential particular from those at Stadaconé. The evidence we have is all the other way. For example, the vocabulary of Indian words appended to the relation of Cartier's second voyage is styled 'le lâgage des pays et Royaulmes de Hochelaga et Canada, aultrement appellée par nous la nouvelle France.' Now, anyone reading Cartier's narrative must acknowledge that by Canada he means Stadaconé and its neighbourhood; this being so, the inference from the foregoing is that the same tongue was spoken at Stadaconé and Hochelaga."

Mr. Pope gives other reasons for his contention, which it is not necessary to state here. From other sources we learn that the chief of the Indian band who met Cartier at Hochelaga, in their interview with him gave him to understand that their home was by the side of a great lake which they reached by the river Utawa (Ottawa). They escorted him to the top of the Mountain of Montreal, and while making their way to this vantage point of observation, described to him the country whence they came, and where they obtained "Caignetage," a red copper of which they had specimens with them. It has often created surprise in the minds of many how it was that at this time the Huron Indians were in possession of shells and other commodities of the sea shore. The explanation is that frequent trips were made by them to the far west for copper implements and agate arrow heads which they traded off to other Indians of the Maritime Coast for products of the sea on which they placed a high value.

How long the Hurons had been in the possession of their hunting grounds in the vicinity of Lake Huron is not known with any degree of certainty, but that they had been there for many decades, and it may be for many centuries is evident from the fact that when Champlain, in the year 1611, established the frontier trading post of Montreal, he at once set about arranging for trade with the distant Hurons, a large and populous tribe. It has been computed that at that time not less than 16,000 of this aboriginal people occupied the forest home of the Hurons. It is related that in the year 1642, or about that time, two savages of a nation which had once inhabited Montreal accompanied

Mr. Maisonneuve, the then Governor of New France, to the summit of the Montreal mountain "Mount Royal," and calling his attention to the magnificent country that lay before him, said, "All those lands and waters were once ours; we were a number of people in those days, but the Hurons drove out our ancestors. Of those they expelled, one portion took refuge with the Abenaquis, another got shelter from the Iroquois, and the rest remained in subjection to the conquerors."

Colden says that according to a tradition among the Iroquois, their ancestors once inhabited the environs of Montreal.

Garneau, remarking on the meeting between Maisonneuve and the two aged Indians, and what they discussed, says, "An idea strikes the mind while reflecting on the above incident, that those aged men may have been survivors of the aborigines found in quiet possession of Hochelaga more than a century before."

There is much to support the idea that the numerous people referred to by the old Indians were Iroquois-Hurons.

The Iroquois tongue was the mother tongue of the Hurons; their language, their customs, their observances were the same. No matter how much a nation may be divided up, or by what name the component parts may be called, or how distant they may be from each other, if they possess a common language, they are of the common stock. A nation may be composed of many tribes, and the tribes each have an idiom different from the other, yet if they have a common mother tongue, they are tribes of that nation. These tribes will be able to communicate with each other, though they could not communicate with an alien nation. The very fact that the Indians expelled from Montreal, took refuge with the Abenaquis and the Iroquois tends to prove that they were Iroquois-Huron , and when driven out made way to tribes speaking their language and of kin to themselves. The territory of the Abenaquis Indians was in the vicinity of the Iroquois; their hunting grounds were in the now Province of New Brunswick, between the Iroquois and the Micmacs. The names Iroquois and Huron were the French names of these famous tribes of Abenaquis natives. Before the French came into the Province the Iroquois passed under the name "Agonnousionsi," signifying a "constructor of wigwams." The name Iroquois, given by the French, arose from the fact that in their discourses or talk they usually ended with the word "hiro," which means either "I say," or, "I have said," or as we would say, "that is the end of it." This word "hiro" was combined, as an affix with the word "koué," hence we have "hiro-koué," Iroquois. The Indian names of the tribes composing the confederacy were "*Agniers*" *or* "*Mohawks*," "*Onon-*

daguès," "*Goyogouins*," "*Onneyouths*" and "*Tsonnonthouans*." The Indian name of the Hurons was "Wyandotts." The French changed this name into that of "Huron," which is derived from a French word "hure," because of the rugged locks of unkempt hair of the people of that race. It may be said of the Hurons that of all the Indian races in Canada they were not the most warlike, and yet they suffered the most from Indian wars. Their great enemies, the Iroquois, were at war with this nation from the earliest period of Indian history on the continent. Why were the Iroquois enemies of the Hurons? It was not because of any Pocahontas escapade, or because of the avenging spirit of the braves in revenge for an abducted maiden of either tribe. The real reason of their differences, their lamentable disagreements culminating in exterminating war, must be ascribed to other causes.

The French made a permanent settlement in Canada in the year 1603, six years before the Dutch possessed themselves of New Netherlands, now called New York. When the French arrived they found the Five Nations there at war with the Adirondacks. The Adirondacks and the Hurons were allies, and it was that alliance which at that time brought them into conflict with the Iroquois, or Five Nations. The Honourable Cadwallader Colden, one of Her Majesty's Counsel and Surveyor-General of New York, when it was a British province, with great accuracy of statement wrote a history of the Five Nations of Canada, which (as he described) "are the barrier between the English and French in that part of the world, with particular accounts of their religion, manners, customs, laws and government, their several battles or treaties with the European natives, their wars with the other Indians."

I shall adopt this author in giving an account of the origin of the war between the Iroquois and Hurons, which was in progress on the coming in of the French.

Mr. Colden says, "The French settled at Canada in the year 1603. They found the Five Nations at war with the Adirondacks, which they tell us was occasioned in the following manner: The Adirondacks formerly lived three hundred miles above Troies Rivieres, where now the Utawas are situated; at that time they employed themselves in hunting, and the Five Nations made the planting of corn their business. By this means they became useful to each other by exchanging corn for venison. The Adirondacks, however, valued themselves, as delighting in a more manly employment, and despised the Five Nations in following business, which they thought only fit for women. But it once happened that the game failed in the Adirondacks, which made them desire some of the young men of the Five Nations to assist them in hunting. These young men soon became

much more expert in hunting and able to endure fatigues than the Adirondacks expected or desired; in short they became jealous of them, and one night murdered all the young men they had with them. The Five Nations complained to the chiefs of the Adirondacks of the inhumanity of this action; but they contented themselves with blaming the murderers, and ordered them to make some small presents to the relatives of the murdered persons without being apprehensive of the resentment of the Five Nations; for they looked upon them as men not capable of taking any great revenge. This, however, provoked the Five Nations to that degree that they soon resolved by some means to be revenged, and the Adirondacks being informed of their designs thought to prevent them by reducing them to their obedience. The Five Nations then lived near where Montreal now stands; they defended themselves at first but faintly against the vigorous attacks of the Adirondacks, and were forced to leave their own country and fly to the banks of the lakes where they live now. As they were hitherto losers by the war, it obliged them to apply themselves to the exercise of arms, in which they became daily more and more expert. Their sachems, in order to raise their people's spirits, turned them against the Satanas, called by the French "the Ouonons," a less warlike nation, who then lived on the banks of the lakes; for they found it was difficult to remove the dread their people had of the valour of the Adirondacks. The Five Nations soon subdued the Satanas, and drove them out of the country; and their people's courage being thus elevated, they from this time not only defended themselves bravely against the whole force of the Adirondacks, but often carried the war into the heart of the Adirondacks' country, and at last forced them to leave it and to fly into that part of the country where Quebec is now built.

"Soon after this change of the people of these nations, the French arrived in Canada, and settled in Quebec; and they thinking it advisable to gain the esteem and friendship of these Adirondacks in whose country they settled, Monsieur Champlain, the first Governor of Canada, joined the Adirondacks in an expedition against the Five Nations. They met a party of tw hundred men of the Five Nations in Corlars Lake, which the French on this occasion called by Monsieur "Champlain's" name, and both sides went ashore to prepare for battle, which proved to the disadvantage of the Five Nations. * * * The trade with the French, soon after this, drew most of the neighbouring natives to Quebec, and they all joined in the war against the Five Nations. The Adirondacks having their numbers thus increased, proposed nothing less to themselves than the entire destruction of the Five Nations."

Mr. Colden, after relating various stratagems resorted to by the Adiron-

dacks and the Five Nations to overcome each other, then proceeds, "The Five Nations are so much delighted with stratagems in war that no superiority of their forces ever makes them neglect them. They amused the Adirondacks, and their allies, the Quatoghies (called by the French, Hurons) by sending to the French and desiring peace. The French desired them to receive some priests among them, in hopes that those prudent fathers would, by some act, reconcile them to their interest and engage their affections. The Five Nations readily accepted the offer, and some Jesuits went along with them. But after they had the Jesuits in their power they used them only as hostages, and thereby obliged the French to stand neuter, while they prepared to attack the Adirondacks and Quatoghies (Hurons), and they defeated the Quatoghies in a dreadful battle fought within two leagues of Quebec. This defeat, in sight of the French settlements, struck terror into all their allies, who were at that time numerous, because of the trade with the French, which furnished them with many of their most useful convenencies."

Mr. Surveyor-General Colden's relation proves two things. 1st. That the war as between the Iroquois and Hurons at the beginning of the Seventeenth Century, originated with the Iroquois in revenge for the treacherous conduct of the Adirondacks in murdering young men of the Five Nations. 2nd. That the war once commenced extended to the Hurons, the fast allies of the Adirondacks in peace or war.

The Rev. E. F. Slater, in his article contributed to the Narrative and Critical History of America, says, when Champlain arrived in Canada he was met at Tadousac by 1,000 Indians, among others, Algonquins, coming from the vast region watered by the Ottawa. They had just returned, he says, from a conflict with the Iroquois, near the mouth of the Richelieu.

This was no doubt the same conflict to which Mr. Colden refers in his narrative.

Champlain had not been long in Canada when he thought it to his interest to form an alliance with the Hurons. This he did, and in 1609, with his Huron and Algonquin allies, came across the path of 200 Mohawks, which were met in the neutral territory near Ticonderoga, Lake Champlain. In this engagement, Champlain inflicted a severe blow upon he Mohawks, and returned to Montreal amidst great rejoicings. In 1615, Champlain made another expedition against the Iroquois of the Mohawk Valley. To effect his purpose he pursued what would now be called a very large and circuitous route. The course he followed was up the Ottawa to Lake Nipissing; crossing this lake he entered the channel of the French River, entered Lake Huron and coasted along Georgian Bay till

he reached the present Lake Simcoe. Crossing Lake Simcoe, he by rivers and lakes and frequent portages reached Cataraqui, at the head of the St. Lawrence River. He and his allies concealed their canoes on the east side of the river, and on the 10th July, reached the Iroquois fortress and stronghold. He and his Huron Indians made an attack on the Iroquois fort. The attack did not prove successful—the Iroquois were found too redoubtable warriors. They conducted the defence of the fortress with great skill. Champlain was wounded in this engagement, and was obliged to give up the contest. He and his war party retreated to the woods to the north of Kingston, where they remained some time in ambush fearing an attack from the victorious Mohawks, and finally returned to the home of the Hurons in Simcoe.

The Hurons, though not able to cope with the Iroquois in successful war, were the most susceptible to christianizing influences and to habits of civilization of all the Indian tribes. To the French is due the credit of introducing christianity among the Hurons. Jesuit missionaries were sent into their country at a very early period. It was not, however, till after the treaty of St. Germain-en-laye, that any organized system of missionary effort was adopted.

Previous to 1629, when David Kertk, a French Huguenot, captured Quebec for the British, there had been some attempts made to bring the savages under Christian influence, but such attempts were not fruitful in results. It may be remarked here as an uncommon event on the page of history that the French stronghold of Quebec should have been attacked and conquered by a French admiral—but so it was. At this time the French Catholics and the French Protestants or Huguenots were at war. It became convenient for the English to declare war against France. French officers were put in command of British ships to attack Quebec in the outlying Province of Canada, hence the singular spectacle was presented of a French officer (Kertk) becoming the master of the chief town of New France, which he held for three years, when it was restored to France by the treaty of St. Germain-en-laye in 1632. Shortly after this treaty the Jesuits went about their work of establishing missions in Indian territory in earnest. They built chapels and mission houses throughout the Huron lands. As the stations increased new chapels were built in the Huron missions. In 1639, the mission house of St. Mary's was erected in the heart of Huron Country. The missionaries extended their labours to the neutral nations on the shores of Lake Erie, and to the Sault Ste. Marie, at the head of Lake Huron. The conversion of the Indian to Christianity was not an easy matter to accomplish. The missionaries in 1640 were only enabled to claim one Christian out of the 16,000 Huron Abenaquis. The

bible and the sword usually travel together in the subjugation of pagan nations. In the case of the Hurons, their trouble did not arise from any difficulty with any Christian power, but they were continually subjected to invasions by the unfriendly Iroquois. The Dutch settlers in the Province of New York supplied the Iroquois with fire arms which they were not slow to use against their enemies, the Hurons. The Iroquois and Huron war, up to this time (1640), was a desultory war, the Iroquois, by stealth, getting into the Huron territory and making sudden onslaught on the not so well armed Hurons, chopping them to pieces like bundles of sticks. In 1642, Father Jogues, who had been sent to Quebec for supplies of provisions for the hard pressed Hurons, while journeying back fell in with the Mohawks, the chief tribe of the Iroquois. The Mohawks massacred most of the party and led the rest, with Father Jogues, to the missionary towns. There were at this time five churches in as many towns of the Hurons.

M. DeMaisonneuve arrived out from France as Governor of Canada in 1642. He was, on his arrival in the country, advised not to go up the river St. Lawrence beyond Quebec. He was courageous and determined, and pushed his way up to Hochelaga or Montreal, which he fortified with palisades and re-christened the place "Ville Ste. Marie." The French inhabitants at this time were completely at the mercy of the savages. The whole European population in Canada did not then exceed two hundred. DeMaisonneuve, in his zeal for Christianity, and to afford the natives the best opportunity for practising it, gathered around him at Ville Ste. Marie, the Indians who had embraced the new religion and invited them who had a desire to become Christians to join their company. The Jesuits did the same at Quebec. Could the missionaries have stayed the hands of the Iroquois it is possible that the Huron nation might altogether have been converted to Christianity. But this was not to be. The Iroquois were constantly on the war path, and in 1648, commenced a war of extermination. On the 17th March of that year the Iroquois fell upon the Huron missionary village of St. Louis, the station then taking the name of St. Ignatius, which was then in the care of Pere Jean-de-Brebeuf and Pere Gabriel Lalemant, both of whom, with most of the inhabitants, were put to death. Fathers Brebeuf and Lalemant were, as one historian describes, "subjected to torments such as devils alone would be thought capable of inflicting; all of which their colleagues reported they bore with an unfaltering reliance on their Saviour, equal to that of the primitive martyrs."

Again on the 4th July, 1648, a numerous body of the Iroquois fell suddenly upon the flourishing village of St. Joseph (in the Huron country), then superintended by Pere Anthony Daniel who had been resident among the Hurons fourteen years. The Iroquois in this onslaught massacred the

whole village, including Daniel, set fire to the mission house and church and threw Daniel's body into the burning church—thus was the martyr buried in the flames of the sanctified house erected to the glory of God and the advancement of Christianity. The Jesuit priests of that day were truly a valiant, self-sacrificing body of men. They went out into the wilderness to civilize and Christianize the native tribes; they gave up their lives for the propagation of the gospel. Some may differ from them in their methods, but it can not be denied that the love which begets courage marked their actions in their dealing with Indian tribes. There have been Catholic martyrs and there have been Protestant martyrs; it is doubtful if any earned a more deserving crown than the Jesuit fathers who undertook the difficult task of Christianizing the North American Indian. The massacre of the Hurons, committed by the Iroquois at St. Ignatius and St. Joseph, so completely shattered the Hurons that they determined to abandon their settlement in the territory around Lake Huron, and endeavor to make a home for themselves in some other place. Theirs was a cruel fate. In conjunction with the missionaries they had built up many churches and many bark and wigwam towns. When they determined to take leave of the Huron territory they abandoned no less than fifteen of these towns. In leaving, some went to one place, some to another. Some took up their abode on the Island of St. Joseph, where the relentless Iroquois pursued them. Some took refuge in Sault Ste. Marie, Detroit and Sandusky, while others made their way to Quebec. The Jesuits took charge of this band, led them to the Island of Orleans, and subsequently gathered a remnant of them at Lorette, where their descendants still remain.

It would extend the limits of this paper to too great a length were I to give a more detailed account of this ancient tribe. Sufficient has been written to show that they were a nation singularly susceptible of Christian influences, that they were victims to the revenge of the dreaded Iroquois, of a nation not so numerous but more powerful than themselves. Incidentally, the actions of the Iroquois in their warfare do not appear in an enviable light. It is to be remembered, however, that they were a savage nation whose spirit of revenge had in some way been roused to such a pitch as never allowed itself to be appeased till they had annihilated the Canadian Indians on the shores of Lake Huron.

It is but justice to the Iroquois to say that although endowed with all that spirit of revenge which is so natural to the Indian, they were a valiant and commanding band, not surpassed by any of the native tribes in America. They were always firm allies of the British, and under the discipline of Brant in later times, gained for themselves imperishable renown.

THE SETTLEMENT AND ORIGINAL SURVEY OF NIAGARA TOWNSHIP.

By William Canniff, M.D., M.R.C.S. Eng.

(Read 2nd July, 1890.)

It was the successful rebellion of the thirteen American colonies, 1776, which led to the settlement of Upper Canada, now the Province of Ontario. The struggle terminated in 1783, and it was in that year and the year following that the U. E. Loyalists mainly entered the wilderness of Upper Canada. But prior to that, there is good reason to believe, a certain number had crossed the Niagara River from the fort, where, during the war had been a garrison, and to which refugees fled from the time of General Burgoyne's defeat. Fort Niagara, during this time, had been the headquarters of a celebrated colonial regiment, the Butler's Rangers. It was here that the regiment was organized, and recruits were enrolled from among the refugee loyalists, and from this fort the Rangers went forth again and again on raiding expeditions. The refugees collected around the fort in tents and rude cabins, and received the necessaries of life from the Government stores. They consisted of the old, middle-aged, and the young, and of both sexes. Those who were unable to serve as soldiers naturally looked about for something else to do and for a place of more permanent habitation. Consequently there is reason to believe that some time before the end of the war not a few individuals and families had crossed the river and squatted along the river and lake on the western side; so that at the close of the war there had already been formed a settlement in what is now the Township of Niagara, and perhaps more distant places. Not all of these pioneers were connected with Butler's Rangers, but were U. E. Loyalists who had been compelled to leave their homes and estates in the revolting colonies to be appropriated by the rebels.

The survey of the land into townships was begun soon after the end of the war. It is not probable that much more than a beginning was made in 1783, but in 1784 it was actively proceeded with along the Niagara River, as well as in the east, on the Bay of Quinte and the River St. Lawrence. We learn from the original plans in the Crown Lands Department that, commencing July 29, 1784, a line was run from a point about a mile up the river, from the site of Navy Hall, or at the present ruins of

Fort George, westward, to the Four Mile Creek, and afterwards to the boundary of the Township of Grantham—the "original garrison line to the Four Mile Creek," which is now known as the "east and west line." That portion on the lake side was "constituted a military reservation," or "lands reserved by the Crown, extending to the Four Mile Creek." This was "by the order of General Haldimand." To the south of the line the land was laid out in lots, fronting on the Niagara River. Looking at the map of the township the lots seem to be of uniform size, but a memorandum on the original plan indicates that some exceptions originally existed. It relates to the survey by Surveyor Philip R. Frey, 1787, and is as follows:—"The lots are laid out 20 chains in front and extending 50 back, with one of allowance every second lot. The regular survey differs a good deal in front from number four down to thirteen; these lots were settled prior to any survey. A memorial of all the owners concerned to the land board, stating that their improvements would be much hurt should the original line be changed, the board consented to grant their lots conformable to their possessions." There are eight concessions in the township south of the line, with 23 lots in each tier. They are numbered from the front, beginning at the south, and in the second tier from north to south, and so back and forth through the concessions. Philip R. Frey had charge of the work of surveying. In a letter written by Augustus Jones to Thomas Ridout, Surveyor-General, January, 1823, he "gives the principal of the surveys performed by the acting deputy surveyors under the superintendence of Philip R. Frey, deputy surveyor for Detroit and Niagara." On the pages of an account book in the Crown Lands Department, 1787, is found "a statement of people's accounts who were employed at surveying by P. R. Frey, deputy surveyor for the district of Nassau, township No. 1." It will be remembered that Lord Dorchester divided that portion of the Province of Quebec, now comprising the Province of Ontario, into four districts, Lunenburgh, Mecklinburgh, Nassau and Hesse. The district of Nassau extended from the River Trent to Long Point, Lake Erie. Among those employed by Surveyor Frey were Ebenezer and Augustus Jones, John Claus, Robert Conklin, Peter Hare, jr., Andrew English and Daniel Hague. These acted as surveyors, and received 4s. per day. The name of Andrew Miller also appears as a surveyor; probably it was before the time of Frey. It appears from a letter written by Augustus Jones in 1825 that it was he who did the surveying at Niagara in 1787, but it was under the superintendence of Surveyor Frey. Augustus Jones became one of the most prominent surveyors in Upper Canada. He had at that time a father and brother living with him. Whether the Ebenezer mentioned was father or brother cannot be said. We learn from a letter written by Augustus Jones to Surveyor

John Collins, November 10, 1791, that both his father and brother had died in the previous month. A letter, dated at Quebec February, 1791, from John Collins, "congratulates Augustus Jones, Esq., on his appointment to our department," and "gives him instructions for the business to be done in the district." Surveyor Collins wrote that he had long since asked Mr. Frey for a plan of the district with the proprietors' names written on each plot, and he requests Mr. Jones now to furnish them. The receipt of these plans is acknowledged by Mr. Collins, January 23, 1792.

It seems that, although the reservation was nominally held for military purposes, it was understood that Col. Butler and some other favourod person of the Rangers should eventually possess the land, and doubtless there was a minute of the executive council to that effect. Had such not been the case Col. Butler and others would not have located themselves in different parts of the reserve. This view is supported by a minute on the original map (1787). Except the reserve of Navy Hall and Butler's barracks, the other part of the military reservation had "been located to Col. Butler and his rangers." The present military reserve seems to have been surveyed by Frey, according to a footnote on the map, "by order of Major Campbell, June, 1787."

Looking at the map of Niagara township it will be seen that the land north of the east and west line (the old "military reservation") is laid out into lots which almost defy description. Indeed it is impossible to conceive on what principle the division was made. The extraordinary shape of the lots is shown in the enlarged map before you, taken from the original in the Crown Land Department. It may, however, be supposed that Col. Butler and others of his band located themselves as inclination led them, and, from year to year, made improvements according to circumstances and convenience; and, when the time came to have a survey, each one and all had the land so divided as to give to each one the benefit of his labor and improvements, and continue the advantages he had enjoyed. The survey of the military reservation was made in 1794, but the Town of Newark was surveyed in 1793.

The following are "Field notes of the boundary line of the Town of Newark, surveyed the 22nd of November, 1793, by Lewis Grant, D.P.S."

"Begin at a white oak tree with a broad arrow on two sides, at three chains distance from the River Niagara, and running west 77 chains to a beech tree marked on two sides with a broad arrow, and then run north (nearly) two miles 75 links to the banks of Lake Ontario; three chains 50 links to the east of the inlet of the One Mile Pond, with a white oak post on the top of the bank."

The memorandum in the Crown Lands Department of the survey of the reservation says:—"Field notes of a survey by Abraham Iredale, D.S., for Col. Butler, Messrs Ball, Secord, and others, bounded by the garrison and town line, Lake Ontario and the Four Mile Creek, surveyed between 11th and 29th of August, 1794." On August 10 the survey began "at a white ash tree marked with a broad arrow on two sides, standing three chains west of the Niagara River." (But a note speaks of "a line run for Col. Butler near the town, 17th October, 1793. "Began at a point on the banks of Lake Ontario to the east of One Mile Pond.") Thus began the survey of the remarkably irregular lots of the "military reservation."

In addition to the names of Butler, Ball and Secord are found those of Col. Arent Bredt and Daniel Servos. John Butler had 551½ acres; Jacob Ball & Sons, 862; John Secord had 486¾ acres; Daniel Servos, 356 acres; Arent Bredt, 91. On some of the early maps are found as a subdivision of Col. Butler's lot the names of Johnson Butler, 120 acres; Thomas Butler, 300 acres; Andrew Butler, 115 acres. "Comformable to a verbal order by his honor the chief justice, December 14, 1802," other names are found on lots, as that of David William Smith, who was designated captain and was acting surveyor-general in 1794; Peter Russell, who was President of the Executive Council after the recall of Gen. Simcoe, and who was 'kind to himself' in making grants of land, had 160 acres; Robert Addison, the first clergyman in Upper Canada, had 45 acres; Anthony Slingerland received 120 acres. West of Four Mile Creek the lots were surveyed more uniformly."

Upper Canada was erected into a province by an Imperial Act, 1791, and the following year General Simcoe arrived as the Lieutenant-Governor of the new province. When he arrived at Niagara he found on the west side of the river, upon a point of land known as Mississaga Point, a small village. Here, it is recorded, was the largest collection of houses in Upper Canada at that time after Kingston, and where he decided to make his residence and the capital of the Province. To the place he gave the name of Newark, which was also sometimes applied to the township. Governor Simcoe made his home "in a small frame house half a mile from the village." It is stated that this village which had sprung up since 1784, was at first called "Loyal Town," then "Butler's Town" or "Butlersburgh." It was also sometimes designated West Niagara. At this time there was, up the river at the end of navigation, and at the commencement of the portage around the falls to Lake Erie, a small village, which had arisen from the course of travel upwards to the western lakes. The boats which left Kingston on their way westward were here unloaded. And this place had taken the name of Queenston, a name which it retains

in the present day. Rochefoucauld says of that village. 1795 :—"The different buildings, constructed three years ago, consist of a tolerable inn, two or three good storehouses, some small houses, a block-house of stone, covered with iron, and barracks. Mr. Hamilton, an opulent merchant, who is concerned in the whole inland trade in this part of America, possesses in Queenston a very fine house built in the English style. He has also a farm, a distillery, and a tanyard. The portage was formerly on the other side of the river; but as this, by virtue of the treaty of 1794, falls under American dominion, government has removed it hither."

From the mouth of the Niagara River westward to the head of the lake are a number of creeks which discharge themselves into the lake, or rather into ponds, which are separated from the lake by bars of sand. These creeks are known by numbers, according to their distance from Niagara. Thus we have 1 mile creek and 2, 4, 6, 8, 10, 12, 15, and so on. At the mouth of each creek is a pond, separated from the lake by a sandbar. The outlet to the lake is not always open. At some of the ponds, when the water is low, the bar completely separates the pond from the lake. In the spring, or when there is a freshet, the water washes away the sand and makes a channel to the lake. These ponds vary in size: at One Mile Creek it is four or five acres in extent; at Two Mile Creek it is some sixteen acres.

Original routes. The aborigines were wont to journey across the Niagara peninsula in passing from one region to another. Their habit was to follow as much as possible the shores of a lake or a stream to or from its source. The traces of old Indian trails are frequently met with in all parts of Canada. These trails were also followed by the first explorers of the primeval wood; and the first settlers likewise used them in their travels. Not unfrequently these trails became permanent roads. A stream would sometimes be followed by the birch canoe, but usually along the course of the stream would be a trail, not exactly following the shore; but when its course was devious, the trail would take a direct line; but always ending at or near the source of the stream. Then there would be a portage to the head waters of another stream running in another direction. There were also portages to get around unnavigable rapids or falls.

The Niagara River was a great thoroughfare for the French and English to pass from one lake to the other, the portage extending from below the heights to a point above the falls. But there is no evidence that the Indians very often passed this way. Their route most frequently was eastward and westward; and the several creeks on the south shore of Lake Ontario, west of Niagara River, and now known by numbers,

were usually followed. From the source of the stream was a trail to the Niagara River above the Falls. In passing between Lake Ontario and Lake Erie, it appears that a more direct route was found by the Indians by way of the Grand River, with a trail to Burlington Bay, which seems to have been a central point towards which converged portages from different directions. Besides the Grand River route, there was a trail westward to the River Thames. The lake road westward from Niagara to Grimsby does not follow the lake shore, and, it is said, marks an original Indian trail passing to and from the mouth of the Niagara River, and, from its devious course, it may reasonably be suppossd that such is the case. But it seems evident that the Indians passing back and forth from the west to the territory south-east of the Falls, instead of following the lake shore and Niagara River, took a shorter route to the Falls by following the Four Mile Creek, the source of which is in that direction. Sometimes they travelled by canoes, sometimes on foot. Along the east side of the creek is a road more or less devious, extending from the lake road to the Village of St. Davids; this is the "Indian line road," or "Four Mile Creek road." From the source of the creek to Niagara River it was called "the Portage road." This road is mostly on the east side of the creek, and part of the way close to it, but at St. Davids it crosses the creek by the west bank. For a few miles from the lake the road is delightfully irregular in its course.

In the Toronto Public Library is an interesting record of the survey and grants of land to David William Smith and his family, in connection with which there is a map on which are traced several old roads. One is on the east side of Niagara River, and is designated "Road to Slocher" (Schlosser), another running south-westwards from the river, near the beginning of the east and west line, is marked, "Old road to Detroit," while a short road running south from the town plot to join it is the "new road." The lake shore road is called the "road to York."

SLAVERY IN CANADA.

By J. C. Hamilton, LL.B.

(Read 3rd July. 1890.)

Mr. Hamilton presented the results of a study of existing records, and stated the facts relating to this subject so appearing.

He began with the origin of the institution of slavery in Canada, 202 years ago, in the reign of King Louis XIV., who was then busy aiding and advising his good friend and brother, James II. of England, and in watching the movements of William Prince of Orange, and preparing for war with Germany. The Secretary of State, however, as soon as he found a leisure moment, brought before his Majesty certain letters from high officials in the Province of Quebec. There were two, dated 10th August and 31st October, 1688, from Mons. de Denonville, and one from Mons. de Champagny, dated 6th November, 1688, to the secretary, their purport being, to represent that working people ("gens d'industrie") were so extraordinarily scarce, and labor so dear in Canada, that all enterprise was paralysed, and that it was thought the best remedy would be, to allow the importation of negroes as slaves.

The Attorney-General of Canada, then in Paris, assured his Majesty that such was also his conviction, and that if permitted, some of the principal inhabitants would purchase slaves as they arrived from Guinea. His Majesty finally got to a consideration of the subject. Perhaps he talked it over with King James, who visited Paris in December, 1688, having "left his country for his country's good," and the result was a royal mandate written early in 1689 stating that his Majesty had approved of the proposal, that his royal subjects of Quebec should obtain negroes to do their work. He added that he wished care to be taken, lest the negroes, coming from so different a climate, might not endure the rigor of Canada, and so the important project fail.

The *code noir* contains an ordinance of 13th November, 1705, making negroes movable property, and providing for their humane treatment. In 1709 an ordinance was issued by Raudot, intendant at Quebec, reciting the king's permission, and that negroes and Panis (Pawnee Indians)

had been procured as slaves, and to remove doubts as to ownership, it was ordained that all such Panis and negroes who had been so bought or held should belong to the person so owning them in full proprietorship. Attached to this is the certificate of one Cognet, that he had duly published the ordinance by reading it after mass, in certain churches in City of Quebec. The 47th article of the capitulation of Canada to the English provides, that all such negroes and Panis should remain in their condition of slavery. This was on September 8th, 1760. The negroes so introduced were mostly from African cargoes landed at Jamaica, and other West India Islands. Some were from the United States.

Slaves were often cited and described in legal and other notices and documents in Lower Canada as chattels, such as "negroes, effects, and merchandise." By Act of the English Parliament in 1732, 5 Geo. II., cap. 7, houses, lands, negroes, and real estate within the colony, were liable to be sold as assets to satisfy their owner's debts. Both negroes and Panis appear on the parish records. Thus on the 13th March, 1755, at Longue Pointe, it is reported that Louise, a negress of M. de Chambault, had been buried, and on the same register is the certificate of baptism, dated 4th November, 1756, of Marie Judith, Pani, about twelve years of age, belonging to the Sieur Preville.

In the newspapers of the time are several advertisements for sale. In the Montreal *Gazette* of 18th March, 1784, Madame Perrault offers a negress for sale, and a week later is advertised "a negress about 25 years, who has had the smallpox and goes under the name of Peg."

In March, 1788, the Montreal Court of Common Pleas had before it the case of Jacobs v. Fisher, claiming the delivery to the plaintiff of "two negro wenches," and judgment was given that the slaves should be given up or £50 damages be paid. Several similar cases are on record in Montreal and Quebec.

BRITISH LEGISLATION TOUCHING COLONIAL SLAVERY.

In July, 1797, an Imperial statute was passed which recited the Act of George II. referred to, and that it was deemed expedient that change should be made in the law in so far as the compulsory sale of slaves under execution was provided. That provision of the Act was therefore repealed as far as it referred to negroes in his Majesty's plantations. The agitation against the slave system had then fully begun in England. Lord Mansfield had decided the celebrated Somersett case, freeing the negro slave brought from Jamaica to England. This, and the misconstruction of the last recited Act, soon had a marked effect on the future

of the negro in Lower Canada. In February, 1798, "Charlotte," a colored slave, was claimed by her mistress and released on *habeas corpus* by Chief Justice Sir James Monk at Montreal. "Jude," another negress was soon afterwards arrested, as a runaway slave, by order of a magistrate. The negroes in Montreal, knowing of the "Charlotte" case, became excited and threatened to revolt, but when the woman was brought before the Chief Justice, he released her also, and declared to the effect, that in his opinion slavery was ended. On the 18th February, 1800, the case of "Robin" came before the full Court of King's Bench, Mr. James Fraser claiming him, when, after argument, it is recorded that it was ordered "that the said Robin *alias* Robert be discharged from his confinement." It seems clear that the court was wrong in its judgment, and that slavery in law existed in Lower Canada until the Imperial Act of 1833 removed it from all the colonies. An effort was made in the Provincial Legislature to obtain an act to define the true position, but without success. The masters, who were mostly residents of Montreal and Quebec, and the country members not having such property, had no interest in sustaining the system for the benefit of the wealthier citizens, who had to acquiesce in the inevitable, and slavery ceased *de facto* in that Province from and after the decision in the "Robin" case, 18th February, 1800.

SLAVERY IN UPPER CANADA.

The system was here introduced before the separation of the Upper and Lower Provinces in 1791, but our population was then small and scattered. We had a few hundred negro and a few Pawnee slaves, mostly around the Niagara, Home and Western districts.

In 1793 the first Parliament of the Province, meeting in its second session in Navy Hall, of which part remains in the low, brown, wooden buildings still visible from the wharf at Niagara, then called Newark, passed an Act which, while it prohibited the importation of slaves, confirmed the ownership in slaves then owned, and provided that their children should be free on attaining 25 years of age. The members of this first Parliament, thirteen in number, with Mr. Macdonell, of Glengarry, as Speaker, were mostly strong U. E. Loyalists. The Act regarding slavery was, it is thought, drawn by Chief Justice Osgoode (who became C. J. of Upper Canada, 29th July, 1792) at the suggestion of that good Englishman, Governor Simcoe, who in his speech on closing the session of 1793, and consenting to this Act, expresses

the great relief he felt at being no longer liable to be called upon to sign permits for the importing of slaves.

This remained the position till 1833, when the Imperial Act removed all remains of the system. Before the passage of the Act of July, 1793, some of the States of the Union had passed similar Acts, *e.g.* Rhode Island and Pennsylvania. New York followed in 1799 with a provision for gradual emancipation, which was followed by complete abolition in that State, 4th July, 1827. Mr. Hamilton cited several cases of slave advertisements, notably that of the Administrator, Hon. Peter Russell, who at York, on 19th February, 1800, offered Peggy, aged 40, and Jupiter, aged 15, for sale, the woman for $150 and the boy for $200, "payable in three years secured by bond, but one-fourth less would be taken for ready money." Mr. Russell's sister, Miss Elizabeth, had a pure negress named Amy Pompadour, who attended her mistress dressed in a red turban. Miss Russell made her a present to Mrs. Captain Denison, of York, who was the great-grandmother of several of Toronto's well-known citizens. Amy had a son, born during a visit of the Duke of Manchester to the town, who was named in memory of the duke and Mrs. Denison, Duke Denison, and lived to the middle of the century.

In the Niagara *Herald* several advertisements are found relating to slaves; so in the *Gazette and Oracle* early in the century—one refers to an Indian slave or *Pani.* Mr. Charles Field, in the *Herald* of 25th August, 1802, forbids all persons harbouring his "Indian slave Sal." Messrs. W. & J. Crooks, of West Niagara, in October 1797, advertised in the *Gazette and Oracle* "that they wanted to purchase a negro girl of good disposition from 7 to 12 years of age." It is interesting to note that these beautiful grounds of the Chautauqua Assembly were the old Crooks farm. On it still, within sight of the amphitheatre where we are now assembled, is the frame buff-painted family farm-house or homestead. Among the records in the register of St. Mark's parish church, Niagara, is the following certificate :—

"Married, 1797, Feb'y 5, Moses and Phœbe, negro slaves of Mr Secretary Jarvis."

Another noted Niagara citizen, Colonel Thomas Butler, advertised in the U. C. *Gazette* of July 4, 1793, offering $5 reward for his "negro man servant named John."

An account was given of Solicitor-General Gray and his slaves, Dorinda Baker and her children, Simon and John. Mr. Gray lost his life on the schooner *Speedy*, a Government vessel wrecked on Lake Ontario,

7th October, 1804, and with him died his body servant, Simon Baker. Simon's brother John lived till 1871, and died in Cornwall, Ont. But he, and all Mr. Gray's other slaves were freed by his will, which is proved in the Surrogate Court at Toronto. Lieut.-Governor Sir A. Campbell favored the reader with a note as to slaves in Kingston, stating his interest in the subject, and concluding :—" I had personally known two slaves in Canada ; one belonged to the Cartwright and the other to the Forsyth family. When I remember them in their old age, each had a cottage, surrounded by many comforts, on the family property of his master, and was the envy of all the old people in the neighborhood."

Sir Adam Wilson also informed the reader of two young slaves, " Hank " and " Sukey," whom he met at the residence of Mrs. O'Reilly, mother of the venerable Miles O'Reilly, Q.C., in Halton County about 1830. They took freedom under the Act of 1833, and were perhaps the last slaves in the Province.

NEGRO SLAVES ON OGDEN ISLAND.

A description was given of Ogden Island in New York State, in the St. Lawrence River, opposite Morrisburg, Ontario, a beautiful place of 1,000 acres, where about 1810 Judge David A. Ogden built a mansion, and resided in patriarchal state, having 25 negro slaves, part of the dowry of his wife, a North Carolina Lady. They were happy and contented, and though free to go and come to the Canada shore, none ever deserted. At the rear of this house and in the yard may be seen the " negro quarters." Some of these servants were voluntarily set free by Judge Ogden. One of them, an intelligent, amiable man, was known as " Old Uncle Kit " on both banks of the St. Lawrence. He became a clergyman of the African Episcopal Methodist Church, and pastor of the old Leonard street and now Bleeker street colored church, New York City, and passed among his colored brethren, till his death about 1880, as Rev. Christopher Rush.

It is pleasant now to look back three score and ten years and see these contented servants moving about the grounds, or in company with white masters, and guests of this old and honorable family, pulling out to fish, among the green islands, or with bows and firearms seeking game, then abundant in the neighborhood.

Nova Scotian Slavery was referred to. The system was never there abolished by Parliament, but was unsuited to the climate, and fell into desuetude. The like was the case in the other Maritime Provinces.

Two references to slavery there were given, one in a deed registered in Truro in 1779, in which one Harris conveyed to Matthew Archibald his interest in a twelve-year-old negro boy called Abram for 50 pounds cy. The other is an advertisement dated 23rd June, 1800, of sale of "a stout negro girl, aged 18 years, good-natured, fond of children, and accustomed to both town and country work. For particulars, apply at the Old Parsonage, Dutch Town."

The reader concluded with references to Africans held as slaves to Indians. He showed that while such slavery was common among the southern Indians, Creeks, Choctaws, and Cherokees, it did not obtain among Canadian tribes. This was owing to their nomadic habits and to the climate. The famous Mohawk, Captain Brant or Thayendenaga, is by some thought to have been a slaveholder. It was shown by reference to history and to enquiry now made of living descendants of Brant that such was not the case. He had large estates at Burlington Bay and on the Grand River. Here many runaway negroes from the States had come, were treated hospitably, and remained working and living with the Indians, often adopting their customs and mode of living. Several descendants of such fugitives are now living on the Six Nation reserve near Brantford.

Notwithstanding severe preventive laws passed by the Choctaw and other Southern Indian nations, mixture of blood obtained to a marked degree, the negroes, free and slave, intermarrying the Indians, becoming part of the nation. There is also a considerable intermixture of such blood in Ontario on certain of the reserves. Though the word Panis in the records referred to seems to have special reference to Indian slaves, it is sometimes used by old Canadian writers to signify all persons in servitude without regard to color. It is of Algonquin origin. Slavery in Canada was of a mild patriarchal type. Slaves could not be sold under compulsory process of law, nor members of families separated without the owner's consent. Marriage and ties of kindred seem to have been observed and regarded kindly.

It does not appear that Canadian owners participated in receiving any part of the £20,000,000 appropriated under the Imperial Acts for the indemnity of masters. The passing of our Act of 1793 was wise and opportune, and left the Province free to work in harmony with the Northern States of the Union and the other colonies which had already adopted, or which were soon to adopt, similar measures. When the harsh system of the Southern States drove many refugees to the Northern States, and, owing to the feeling and laws of exclusion there, the blacks went across the border they found in Canada a home. Here for half a

century they came as to a Goshen or land of refuge, until at the outbreak of the late war between the North and South fully 30,000 had been sheltered, and to a great extent educated and prepared, under our municipal and benevolent institutions, for the proper exercise and enjoyment of the rights and duties of free men.

To the end of time Africa will bless Canada for the refuge and home given to her children in that period of their trouble and trial.

The figures shown are taken from the Lower Canada *Gazette* of June, 1802. The first, of the Pawnee, is used in connection with a French advertisement for a runaway apprentice; the other from a like notice in English. These cuts had been used formerly in advertisements for slaves.

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TWO FRONTIER CHURCHES.

By Janet Carnochan.

(Read 2nd July, 1890.)

It ought to be an interesting and instructive task to trace the history of these two churches of Niagara, St. Mark's and St. Andrew's, dating almost a century back, the one 1792, the other 1794, and see how many links in the history of our town and even of our country can be filled in from those records, which give an ever shifting kaleidoscope of different nationalities, of pioneer life, of military occupation, of the red man, Britain's faithful ally, of the poor slave here for the first time by any nation freed by legal enactment, of strenuous efforts for religious liberty by appeals to Governor and Queen, of sweet church bells, of booming cannons and blazing rooftrees.

The often-repeated sneer that Canada has no history has been so easily refuted in the case of our eastern Provinces with their store of French chivalry and Saxon force, of missionary zeal and Indian barbarities, of fortresses taken and retaken, but still the phrase lingers with regard to Ontario. Surely, we in this Niagara peninsula lack nothing to disprove a statement which, to their shame, many among us allow to pass as if it were a truth. When we think that within the last two centuries four races have here fought for empire, that within sight of us are traces of the adventurous La Salle who traversed thousands of miles by sea and land to perish so miserably on the banks of the river of his search; when we think of this spot as an Indian camping ground, of the lilies of France yielding to our own flag even before Wolfe's great victory, of the landing here of loyal men driven from their homes of plenty to hew out in the forests of this new land a shelter under the flag they loved, of invasion, and three years of bitter strife, surely we have a right to say we have a history.

In my attempt to sketch the story of these two churches I have an ample store of very different materials, a picturesque grey stone church with projecting buttresses and square tower peeping through the branches of magnificent old trees, many tablets inside and out, tombstones hacked and defaced by the rude hand of war, an old register dating back to 1792, kept with scrupulous neatness, all these in the one case; in the

other, in the old volume which lies before me, the interesting business records of almost a century from 1794, if not of so romantic a nature, still shewing the sterling metal of this people, telling of bright days and dark days, of prosperity and adversity, of lightning stroke and tornado, as well as of "conflagration pale," of patient and strenuous efforts by appeals to Governor and Queen from this almost the first Presbyterian Church in Upper Canada. It may be questioned if any other churhes in our land can shew such interesting records.

Now, that the modern tourist has invaded our quiet town and learned of the beauties with which we are so familiar, I am always pleased to remember that as a child I loved and admired St. Mark's, that it was my ideal of an old English parish church, and churchyard, and in those days the tourist had not come to tell us what to admire. When the late lamented Dean Stanley visited St. Mark's he said, "this is a piece of old England, do not allow it to be altered." The register of St. Mark's is unique in this particular, that in almost a century that has elapsed there have only been three incumbents, one with a record of 37 years, another 27, the third, the Rev. Archdeacon McMurray, by whose courtesy I have had access to this record, of thirty-four years. Its value is shewn by the fact that permission was obtained some years since to copy all the earlier pages, and this has been placed in the archives of the Historical Society of the City of Buffalo. The Rev. Mr. Addison must have had a vein of quiet humor, as shewn by the quaint remarks interpolated here and there alike at baptism, wedding or burial. He was evidently a scholar and a lover of books, for his library of several hundred volumes, now in the possession of the church would bring from far and near the lover of rare and curious old books. Here is a Breeches Bible and Prayer Book in which prayer is offered for Henrietta Maria, the wife of Charles I., and in dull dusky leather many rare and valuable books to rejoice the heart of the bibliomaniac.

The first entry is "Aug. 23, 1792, Henry Warren, bachelor, to Catherine Aglor, spinster. Aug. 24th, Capt. James Hamilton, to Louisa, his wife." The remark appended to this tells a tale of a new country. "They had been married by some commanding officer or magistrate and thought it more decent to have the office repeated." "April 12, 1794, William Dixon, bachelor, to Charlotte Adlem, spinster. May 15, Col. John Butler of the Rangers buried, (my patron)." Here is a pathetic entry, "July, 1794, buried a child of a poor stranger called Chambers. Sept. 9, buried a soldier surfeited by drinking cold water. Baptisms, Sept. 3, Cloe, a mulatto. Married, John Jacks and Rose Moore, negroes." These must have come to their new homes slaves, but to the honor of Canada, be it

said, by Act of the Parliament which sat within sight of this spot, declared free long before Britain by many a hard fought struggle in the House of Commons made her chattels free, or our neighbors by the unstinted pouring out of millions, and of a more costly treasure of tears and blood, did the same. The next entry tells of the time when this was the capital. "Buried, an infant child of the Atty.-Gen.'s servant; and Oct. 10th, R. B. Tickell buried," and the comment on some to us never to be explained tragedy, "Alas he was starved." "Sept. 24th, White, the butcher from England, and an Indian child." It is noticeable that the rector must have been indefatigable in his exertions, for we find him baptizing at 12 Mile Creek, 20 Mile Creek, 40 Mile Creek, Ancaster, Fort Erie, St. Catharines, Head of the Lake, Chippewa, Grantham, Falls, York, Long Point. On these occasions, and when people came from long distances to Niagara, there are often a great many baptisms recorded on the one day, the comment "of riper years" shewing many besides children were baptized. June 24th, 1799, occurs a well-known name. "Baptism, Allan Napier McNabb, from York," as also occur the names of Ridout, Givens, Macaulay from the same place. "Buried, ——, worn out by excess at the age of 49. Baptised, Amos Smith, of riper years. Buried, old Mr. Doudle. Baptised, 1801, David, son of Isaac, a Mohawk Indian. Buried, 1802, Cut Nose Johnson, a Mohawk chief. Poor old Trumper, Capt. Pilkington's gardener." These slight descriptive terms show a human interest, a kind heart, a humorous vein. It is remarkable that in all the early notices of baptisms, there is nothing but the name and those of the father and mother; after some time come notices of godmothers, and in 1806 this fuller notice: "May 3rd, Eliza Ann Maria Vigoreux, daughter of Capt. Henry, Royal Engineers, and Eliza, godfather Rev. Louis Vigoreux, godmothers Dowager Lady Spencer and Anna Maria Vigoreux." Here is the name of one who justly or unjustly received much blame in the war. "Baptism, Nov. 20th, 1808, Augustus Margaret Firth, daughter of Col. Henry Proctor, commandant of the 41st Regiment, and Elizabeth. Married, Dec. 11th, 1807, Lieut. Wm. Proctor, brother of Col. Henry Proctor, commanding at Fort George, to Joan Crooks. Nov., 1807, John Conrad Gatman, an old German. Buried, 1810, Master Taylor of 100th Regiment, killed by lightning. Old Amen Misner, May 5th, 1812. Married, Thomas McCormack, bachelor, to Augusta Jarvis, spinster."

Here is the brief record of the hero of Upper Canada, who did so much by wise counsels, prompt action, and undaunted courage, to save our country and repel the invader, who, galloping away in the early morning, was brought back by his companions in arms in sorrow and gloom, a corpse. "Oct. 16th, 1812, burials, Gen. Sir Isaac Brock, Col. John Mc-

Donald, they fell together at Queenston, and they were buried together in the north-east bastion of Fort George." In the Buffalo paper, in which some of these were copied, occurs the rather astonishing and not easily to be understood statement, "we now approach the period of the second war of independence." How an armed invasion of a peaceful neighboring country can be called a war of independence by the invader is an unsolved mystery. Also referring to the burning of our town by the Americans, before evacuating our territory, these words occur. "In one of the engagements between the opposing forces St. Mark's took fire, and all but the solid stone walls was consumed." How differently can be described the same event by different people.

During the time of the occupation of the town by the Americans from May to December, the notices go on in St. Mark's Register, but it may be noted that there are no marriages except those of two Indian chiefs, thus recorded, "Mohawk chief Capt. Norton, to his wife Catherine, I think on 27th July, 1813, when she was baptised, and Jacob Johnson, another Mohawk chief was married to his wife Mary on 21st Aug. this year. Buried, July 17th, Col. C. Bishop, died of his wounds." As this brave young soldier was buried at Lundy's Lane, Mr. Addison must have been called on to ride all these miles to perform this service. The next item gives us another glimpse of warfare. "On the day on which the engagement between Sir James Yeo and Commander Chauncey took place on the lake, our dear friend Mrs. McNabb was buried in Mr. Servos's burying ground, supposed to be 29th September, 1813." This, history gives as the 28th Sept., but it is evident that during this exciting period some of the entries have been made from memory. Here is an entry which shows that though Parliament had been removed, Niagara was preferred as a burial place to York. "10th June, 1816—Buried, George Lane, Esq., Usher of the Black Rod." "Married, 1817, Rev. Wm. Samson, minister of Grimsby, to Maria Nelles. Buried, 1819, James Rogers, innkeeper," and the remark, "a bad profession for any but very sober men." "Sept. 23rd, 1822, Poor old Hope. Feb. 23rd—Baptised, Agnes Strachan, daughter of Hon. Dr. J. Strachan, Rector of York, and Ann his wife." Here may be seen the names of most of the Regiments that have been quartered here, 41st, 8th King's, 100th, 99th, 70th, Sappers and Miners. Of these we still find traces in buttons picked up at Fort George with these numbers.

Rev. Mr. Addison was military chaplain for many years. In 1820 we find another name as performing baptisms in that capacity. The last entry in this hand is 1827, in tremulous characters signed instead of full name, "R. A." And here, in another hand, is recorded the burial of this venerable man, whose zeal, piety and kindness of heart we have seen told

all unwittingly in these pages, "Oct. 9th 1829—The Rev. Robt. Addison departed this life on the 6th, in the 75th year of his age." On the outside wall of the church is a large tablet to his memory, and inside another with this inscription:

"In memory of Rev. Robt. Addison, first missionary in this district of the venerable the Society for the Propagation of the Gospel in Foreign Parts. He commenced his labors in 1792, which, by the blessing of Divine Providence, he was enabled to continue for 37 years. Besides his stated services as minister of St. Mark's in the town, he visited and officiated in different parts of this and adjoining districts until other missionaries arrived. 'Remember them which have the rule over you.'"

The Church was consecrated in 1828, on Sunday, Aug. 3rd, by the Hon. and Rt. Rev. Charles James, brother of the Earl of Galloway, and Lord Bishop of Quebec, in the presence of His Excellency Sir Peregrine Maitland, K.C.B., his staff, and other dignitaries. Morning prayer was said by Rev. Robt. Addison, the lesson and litany by Rev. Thos. Creen, the assistant minister, the Bishop preaching.

So far, I have not met with any documentary evidence to show exactly when the church was built, or how long in process of construction. The new part can be plainly seen forming the cross, while the nave containing the tower is the old part, as shewn by the color of the stone. The pulpits, curiously carved, have the date 1843.

Before the church was built, the congregation seems to have met in the Court House, near the site of the present one, and in the interval during and after the war in the Old Indian Council Chamber, afterwards used as an hospital, lately burned down. This last, with the buildings known as Butler's Barracks, was not burned with the rest of the town, as the British troops were reported to be entering, and they were thus saved. Here are two letters brought to my notice by our distinguished litterateur, Mr. Wm. Kirby, which have been lying forgotten, and now after seventy years throw a flood of light, giving us information unexpected as it is invaluable, and which, through the kindness of the Rev. Archdeacon McMurray, I have been allowed to copy. They were written by Col. Wm. Claus to Hon. and Rev. Dr. Stuart asking assistance from the Society for the Propagation of the Gospel.

"NIAGARA, U. C., Jan. 18th, 1818.

"Anxious that something should be done towards rebuilding our church, which in the winter of 1813 was unfortunately destroyed by the enemy at the time our town was burnt. I would not take this freedom if there appeared the most distant prospect or steps taken to make it even

in a state that we could attend Divine Service, but during this season it is hardly possible to attend. It remains in the state the Commissariat put it in for the purpose of storing provisions in after we repossessed ourselves of the frontier, with the trifling addition of a temporary reading desk and gallery for the troops. Your Lordship saw the state it was in last summer. Nothing whatever has been done or likely to be done. It is not even weather proof. The church was made use of in 1812 as an hospital for the wounded. We were deprived of our all and have barely the means of getting covering for ourselves and families, to which must be attributed the melancholy state the church remains in, &c., &c."

The next letter is dated Niagara, 20th Sept., 1820, and first speaks of the visit formerly paid and goes on thus: "It may not be amiss to recapitulate. Previous to war of 1812 the small congregation of Niagara erected at their own expense a church which cost £1200 cy. After its destruction by fire, application was made in 1816 to His Majesty's Government for some aid towards putting it into a state to perform Divine service in, when His Majesty was graciously pleased to order £500 stg. which has been received and applied, but falls short of accomplishing our wish. Our congregation are too poor to expect much from them. From their living within gunshot of the enemy's lines, they suffered the loss of all they possessed, burnt out and plundered of everything, and they had really not yet recovered their misfortunes from the late unhappy events, &c., &c."

The answer to this letter is dated 25th Dec., 1820, mentions that the Society had lately placed money in hands of Bishop of Quebec for aid in building churches and refers writer to him.

The churchyard is very interesting and also unique, for here may be traced the rifle pits constructed during the war. The church was used by both armies, for after the battle of Queenston Heights it was used as a hospital for our wounded, then by the Americans as a barracks, and again by our own commissariat. What an eventful history! Could these stones speak, (and do they not speak eloquently of the past?) what disputed points in our history might not be cleared up? The lover of the curious may find many strangely pathetic and sometimes strangely grotesque lines here, the desire to be remembered being so strongly implanted in the human breast, but I only copy here those having some bearing on the history of the place.

Length of service seems to be the rule, for in the graveyard is an inscription: "In memory of Jno. Ray, 50 years parish clerk of St. Mark's, who died at an advanced age, Oct. 6th, 1846." The oldest record is placed

inside the eastern door, having been found partly covered up in the graveyard and placed here for safety. It is rudely carved and imperfectly spelled by some hand unskilled in, or all unused to such work :

LENERD BLANCK
DESeaCED
5 AUG
1782

Not many feet from the church is the large flat stone, so often visited, hacked and marred, for to such an ignoble use as a butcher's block were these sacred memorials put in 1813. The hatchet marks have almost obliterated some of the words.

"To the memory of Charles Morrison, a native of Scotland, who resided many years at Machilimacinac as a merchant, and since the cession of that . . . . United States as a British subject by election . . . . . for loyalty to his sovereign. . . . . Died here on his . . . . . to Montreal on the sixth day of September, 1802, aged 65"

In the porch, at the north door of the older part of the church is a tablet which brings back to us the rattle of musketry and rush of foemen the day when Niagara was taken.

"In memory of Capt. M. McLelland, aged 42 years, Charles Wright and Wm. Cameron in the 25th year of their age, of the 1st Regiment of Lincoln Militia, who gloriously fell on the 27th day of May, 1813, also Adjutant Lloyd of the 8th King's Regiment of Infantry.

As lurid lightnings dart their vivid light,
So poured they forth their fires in bloody fight.
They bravely fell and saved their country's cause,
They loved their Constitution, King and Laws."

The last three words, it is needless to remark, are in capital letters. In excuse for the absence of poetry in these lines, it may be said that the people of these days were too busy writing history with their swords to trouble about elaborating musical couplets or quatrains.

Here we unroll a page of history, a name handed down to obloquy by the skill of the poet and the imaginative powers of the sensational writer, but no doubt Time, which rights many wrongs, will do justice to the memory of one so bitterly spoken of by English poet and American historian : when even Henry VIII. finds a justifier, we may hope to

see some histories we wot of revised. The poet Campbell acknowledged his information on the subject had been incorrect, but how difficult to rectify the wrong!

"Fear God and honour the King. In memory of Col. John Butler, His Majesty's Commissioner for Indian Affairs, born in New London, Connecticut, 1728. His life was spent honorably in the service of the Crown. In the war with France for the conquest of Canada he was distinguished at the battle of Lake George, Sept. 1755, at the siege of Fort Niagara, and its capitulation 25th July, 1759. In the war of 1776 he took up arms in defence of the unity of the Empire, and raised and commanded the Royal American Regiment of Butler's Rangers. A sincere Christian as well as a brave soldier, he was one of the founders and the first patron of this parish. He died at Niagara May, 1796, and is interred in the family burying ground near this town. Erected 1880."

Outside the eastern wall is the story of one who has been fondly remembered, for his tragic fate is recorded also inside the chureh on a marble tablet.

"Sacred to the memory of Capt. Copeland Radcliffe, of His Britanic Majesty's Navy, who fell whilst gallantly heading on his men to board one of the enemy's schooners at anchor off Fort Erie on the night of the 17th August, 1814." One is erected at request of brothers and sisters by his nephew, the other by Capt. Dawes, R. N., at request of his mother. We cannot but drop a tear to the memory of a brave young sailor. Another near this, "Donald Campbell, Islay, Argyleshire, Fort Major of Fort George, died 1st Dec. 1812. Interred on west side of Garrison Gate at Fort George." Also the name of Lieut.-Col. Elliott, K.C.B., who fought in Peninsular war, Col. Kingsmill, and a daughter of Chief Justice Sewell. In the church altogether are fifteen tablets, two in the vestibules and three on the outer walls. It may be noted that seven are to military and naval heroes, four to clergymen; four women's names are here handed down.

Much might be said of the beauty of the spot, of the quaint pulpits and vaulted roof, of the chime of bells and the air of quiet repose, but where so many facts have to be recorded, the æsthetic and the emotional must be left for another pen or another time.

In turning now to the history of St. Andrew's we find many places where the records seem to touch, and each help out the other, where the story of one corresponds with the other, and again is widely different. While much attention has been attracted to the beautiful old church of St. Mark's. to which so much romance clings, from the fact that it is almost the only building now left which was not totally de-

stroyed by the fire of 1813, very little is known of the early history of St. Andrew's. The graveyard too is comparatively modern, as all denominations used that of St. Mark's for many years. There are no old grey stones mutilated by the hand of war, no tablets in the wall, no stained glass to give that dim religious light some so much admire. The present church is a square solid uncompromising looking structure of brick and stone with a belt of solemn pines on the north and west. While St. Mark's was built of solid stone, these church pioneers built of less enduring material, and thus nothing is left of the building of 1795, built on the same spot as the present church, erected sixty years ago. The history of the church is preserved in an old leather-covered book, with thick yellow paper, dated 1794, and curious glimpses are given of our country's progress. The oldest Presbyterian Church in Ontario is believed to be Williamstown, 1786, which with several others in the vicinity was presided over by Rev. John Bethune. This ranks next. It may easily be seen that St. Mark's had an immense advantage, with a settled clergyman, with a salary from the Society for the Propagation of the Gospel of £200, while St. Andrew's struggling under a load of debt for many years, with many breaks from the confusion and distress caused by the war, could only have been kept alive by the strenuous exertions of its members. We find many of the same names on the records of both churches. Some baptised in St. Mark's in the breaks in the history of St Andrew's. Many of the residents had pews in both churches. It is interesting to note that while St. Mark's register uses the name Niagara, and Newark never occurs, St. Andrew's record uses the word Newark from 1794, and in 1802 the name Niagara occurs. As a matter of history the name Niagara was formally resumed 1798.

The record dates from 30th September, 1794, and reads thus: A number of people met this day at Hind's Hotel, and resolved that "as religion is the foundation of all societies, and which cannot be so strictly adhered to without having a place dedicated solely to divine purposes, that a Presbyterian church should be erected in the town of Newark and that subscriptions for that purpose be immediately set on foot as well as for the support of a clergyman of the same persuasion." The committee consisted of John Young, Four Mile Creek, Chairman; Ralfe Clench, Andrew Heron, Robt. Kerr, Alexander Gardiner, William McLelland, Alexander Hemphill, any three to form a quorum in trivial matters, but in matters of importance the whole to be assembled. Here follows a bill of lumber, the size of the timbers required would move the wonder of our modern framers, 8x12 and 6x9. We see the size of the building to have been 46x32. No grass was allowed to grow under the feet of these pioneers, for the next day, 1st October, follows an agreement binding them to

support Rev. Jno. Dun, promising to pay £300 for three years, £100 per year with house room, a previous copy having been made out 23rd Sept. The agreement is from 30th June of same year, shewing that they had enjoyed his services from that date. Then follows an agreement as to windows, there being sixteen with 40, 24 and 12 lights respectively. A petition to Land Board for four lots in one square 157, 158, 183, 184. By referring to a plan of the town, we see that the first church stood where the present one now stands. A copy of subscriptions for building church, different sums subscribed from 8 shillings to £10, while the amounts promised for the support of clergyman are about the same per year. Andrew Heron is appointed Treasurer, and "this is to be made public, as the frame is shortly expected down and money will be wanted for the purpose of paying for the same." The whole amount subscribed at this time was £215, of which £160 is marked paid. Among the names is that of Samuel Street, £8.

Then follow receipts from Rev. John Dun of yearly salary; plans for seating and pewing church are brought forward Sept., 1795. On March, 1796, a sexton employed for £6 N. Y. cy. On the same date pews to be let for £3 and £5 each. Here appear the names of Col. Butler, Peter Ball, Daniel Servos, Andrew Heron for sums as high as £10. The 21 seats let this day amount to £150. The last receipt given by Mr. Dun is 8th May, 1797. His name is found afterwards among the pewholders as he gave up the ministry and engaged in trade. The next business meeting is Sept. 2nd, 1802, when the Rev. John Young of Montreal is engaged, to have the privilege of teaching a school. The same day the thanks of the meeting are given to Mr. Jno. McFarland for the bell which he has been pleased to present to the church. Again the seats are let and the names of William and James Crooks, John and Colin McNabb, Jas. Muirhead, the heirs of the late Col. Butler, who we find from St. Mark's register, died 1796. Then follow lists of payments for glass, putty, stoves, stove-pipes, rum for glaziers, rum for raising (2 gallons), interesting as shewing the prices then, rope for bell, "rope wetted," whatever that may mean I leave for wiser heads; covering and foundation for steeple, so that we see the first church had a spire as well as the present; charge for ringing the bell. Accounts from 1804 to 1812, all in a peculiar large hand, the writing almost filling the line, and though so large exceedingly difficult to read. All this time, although there was considerable debt, Mr. Heron seems to have advanced money when needed. We find in 1795 a "large balance unpaid and a great deal to be done to make the church convenient and comfortable." An obligation drawn out requesting "loan of money from those who were able to loan any to this laudable purpose, that the building be not impeded."

The baptisms in this book are only from Aug., 1795, to 1802, except two daughters of A. Heron, recorded in his own peculiar hand 1809 and 1814, Nov. 27th, the latter nearly a year after the burning of the church. The baptisms are performed by the regular ministers and others called visiting ministers. One in 1792 by Rev. John McDonald from Albany, U. S. The children of Ebenezer Colver, township of Louth are entered as baptised in 1781, 1783 and 1791, earlier than any in St. Mark's, but the performing clergyman is not mentioned, but shewing that in those early days this duty was not neglected. Rev. Mr. Mars, a visiting clergyman from 1st Feb. to 14th March, 1801, baptised several. Here we find the good old word "yeoman" used.

Here is a notice which seems to shew friction of some sort. "Resolved that this church is under the direction and control of the majority of the trustees and not subject to the direction of the clergyman." "Resolved that the pulpit, being part of the church, is subject to the majority of the trustees." Provision, however, seems to have been made even at that early date for their share in government, of the *minority*, of which our politicians may take a note. "Resolved that in case of a division of the Society the church shall be held alternately by each party, that is one week to one party and one week to the other. The key of the church to be left at all times with the trustee residing nearest to the church in order that the majority of the trustees may know where to find it when they may see fit to admit a preacher."

In 1804 Mr. Heron presented an account for £176 8s. 3d. lawful money U. C., inspected and approved, as also account of Mr. John Young £27, also approved. Of these we shall see more as the years roll on. Resolved in 1805 that Andrew Heron be clerk. April, 1805, persons named are authorized to obtain services of a clergyman at rate of £75 and £50 to teach 13 pupils, if he be inclined, in Latin, Greek and Mathematics. In this obligation to pay, the word dollars occurs for the first time. In 1809 the Rev. John Burns gives half his time to church, the pews to be let for one-half of that in 1796. His name is also mentioned in 1805 and appears dnring the years 1810—11, 16, 17, 18. He, it appears taught the grammar school and gave part of his time to the congregation, as sometimes he is mentioned as preaching every third Sunday and sometimes every fourth. Different efforts seem to have been made to obtain a Presbyterian of Established Church of Scotland, in 1806 communicating with Rev. Jas. McLean of Glasgow, agreeing to pay his expenses out. He actually preached during June, July, August. the church to be open to Rev. John Burns when it did not interfere with any other engagement of Trustees. In 1809 subscriptions set on foot to finish the church.

From 1812 to 1816 there are no records. No doubt, the war scattered the people and broke up the congregation. Here again St. Mark's had a great advantage, a resident clergyman and a stone church not entirely destroyed ; for, heavy as were the timbers of St. Andrew's, they only fed the flames more fiercely.

In 1818 agreement with Rev. Chas. Jas. Cook. Then in 1820 a petition to Earl of Dalhousie for a sum of money to build a church in town and give title to land on which former church did stand. A collection at Divine service to repair windows and building as far as necessary for comfort of congregation (supposed to be school house). In the *Gleaner* lying before me for 1818, published in Niagara, is an advertisement of "annual meeting of Presbyterian Church, to be held in school house. The accounts of moneys received and expended in building school house will be produced."

In 1820 a letter asking for services of Rev. Thos. Creen, who had preached for them a few weeks and with whom they were pleased. At a meeting in school house, held 1821, "Resolved to put themselves under the Presbytery." Here follow signatures and sums promised, sadly diminished from those before the war. In 1821, Rev. Mr. Smart of Brockville, who was present, was appointed their Commissioner, and on 21st Dec. elders were nominated, Rev. John Burns presiding. Scarcely any records for 1822-23, but in 1824 is presented the former account of £176 8s. 6d., with interest for twenty years, making the whole sum almost the amount, £400 allowed by Government for loss of church. £100 had been received and paid on this account. Some interesting items occur. Paid for deed of church, £6 14s. 6d.; passage to York and back, £1 ; detention there two days, 10s. There seems to have been no settlement of this account till 1833 when follows in small clear writing almost like copper-plate of W. D. Miller, "amount due the two persons named, £203 ; interest for 9y. 4 2-3m. from 1804 till the church was burnt, the commissioners not allowing interest after the church was burnt." This is signed by James Muirhead, Robert Dickson, Wm. Clarke, perhaps as arbitrators, or who state this to be the decision of the majority of the trustees.

The wheels of state must have moved slowly, as this sum £400 demanded in 1820 from the Government, awarded in 1824, was not paid for several years and then only in instalments of 10%, 25%, etc. In 1828, Rev. Mr. Fraser was engaged for two years and in 1829 a call was sent to the Presbytery of Glasgow offering £150, and the Rev. Robt. McGill was sent out. Now come various interesting items bearing on the vexed questions of Clergy Reserves, status of Presbyterian ministers, &c

Fancy a proud, dignified man like Dr. McGill coming from Scotland where he was a minister of the Established Church and finding that he was not allowed to perform the ceremony of marriage. Here are extracts from the dignified and rather curt letter he writes.

"SIR,—I understand it to be required by the law of the Province that a minister in connection with the Established Church of Scotland . . . . must yet submit to request of the General Quarter Sessions authority to celebrate marriage, even among members of his own congregation . . . although I regard this law as an infringement of those rights secured to the Established Church of Scotland by Acts of the Imperial Parliament of Great Britain . . . it seems expedient that I should conform to it, until that church to which I belong shall procure its abrogation as an illegal violation of its rights. I request, therefore, that you will give notice to all concerned that I intend . . ."

Also in this connection comes a copy of certificate to Governor's office, York, for share of money allotted by Her Majesty's Government for support of ministers of Church of Scotland. In 1830, subscriptions for a new church, this is seventeen years after the town was burnt, they having worshipped in the school-room where the Sexton's house now stands. Also a subscription for sacramental silver vessels which cost £20. On looking over the names we find many familiar to us, but so far as I know of the eighty names signed sixty years ago of various sums from £10 to £50 there are just two living now, Wm. B. Winterbottom, Niagara, and Gilbert McMicking, Winnipeg. Such well known names are here as Robert Dickson, Walter H. Dickson, Lewis Clement, Andrew Heron, Thomas Creen, Edward C. Campbell, Robert Hamilton, Daniel McDougall, Robert Melville, Jas. Crooks, Jno. Claus, John Rogers, John Wagstaff. The whole sum subscribed was £760, the church to seat 600. The name St. Andrew's was now used for the first time, salary of clergyman £175 with Government allowance and promise of manse, as soon as possible. Next comes Incorporation of church. The plan of the church and names of those who purchased seats, of whom there are now in the church representatives of six. In 1834, old meeting house was rented for £12.10s. In 1836, directions to advertise for a precentor in the newspapers of the town. Belonging to this period are the Communion tokens, bearing the inscription, "St. Andrew's Church, 1831, R. McGill, Niagara, U.C," which are now in demand by collectors of coins and may yet be quite rare if this rage of numismatists continue. Now comes the vexed question of the Clergy Reserves in the form of a petition to Sir Francis Bond Head for a due support from lands appointed, &c. Now that the bitterness and rancor

caused by this subject is forgotten we may quote without risk of wounding any one the words of the petition to Sir Jno. Colborne, showing the national characteristics of this people, a stern determination to have their constitutional rights and to gain them not by violence but by strictly constitutional means. The petition goes on to state that "they feel aggrieved by an act of the Lieutenant Governor, establishing a rectory by which their rights are infringed and which is incompatible with privileges granted by Treaty of Union between England and Scotland, privileges belonging inalienably in a British colony to subjects of Scotland as well as subjects of England." The institution of the rectory it is said "recognizes the incumbent as sole spiritual instructor of all residing within its bounds and places them in same relation to the Establishment as Dissenters of England are to church established there." To this are signed 128 names, of those the only ones now known to be living are A. C. Currie, Wm. Barr, Jas. McFarland.

Annual meeting 6th February, 1838, we have a glimpse of the Rebellion, "as meeting was unavoidably deferred on account of disturbed state of country from late insurrectionary movement, and piratical invasion from frontiers of U.S., the members being engaged in military duty." In 1838 comes appointment of Jno. Rogers as Treasurer, which position he held till his death in 1883, almost 46 years. It may be noticed that while there have been only three incumbents in St. Mark's, and in St. Andrew's, so many changes, the latter church had the advantage of three faithful officers whose term of office reaches almost to a century.

In 1839, in acknowledgment of sacrifice made by Rev. R. McGill remaining in Niagara instead of accepting a call to Glasgow, a subscription to raise the sum of £300 as a New Year's gift from his congregation. In 1840, reference to school kept by Jas. Webster in school room under control of church, in 1842 called St. Andrew's Church School, and to avail themselves of Act passed in Parliament in regard to common schools. A paper bearing on the subject of Clergy Reserves came into my hands some years ago which I copied. Singularly enough it is not found in this book, as a parchment copy was kept. It is a petition to the Queen in 1842, that, "in consequence of mistakes made in census of 1839, members of Presbyterian Church were underrated in settlement of Clergy Reserves in 1840, and that relief be granted for this wrong." It is signed only by heads of families, 142 names, giving number in each family, making 628 altogether. This was in the palmy days of Niagara, when the church was crowded above and below: in 1844 only one seat and two half seats were not taken, during ship-building at

dock. Of the names signed to this petition only one person is now living, Alexander R. Christie, Toronto.

A legacy of £750 was left by Jno. Young to the church and a statement is made that part of it is invested in Montreal Harbor Loan. Rev. Mr. McGill reports that he has received £52 10s. in interest for the balance which by condition of the will he could use for himself, but minutes go on to say, this he generously allows to church. The only tablet in St. Andrew's is in southern vestibule, reading thus :—"Sacred to the memory of Jno. Young, Esq., long a merchant in Niagara, returning home in pain and infirmity he was drowned in Lake Ontario, where his body rests awaiting the hour when the sea shall give up her dead. In his last illness concerned for the spiritual welfare of coming generations he ordained a bequest for the perpetual maintenance of divine ordinances in this church. He met death July 29, 1840, aged 73. Pray for the peace of Jerusalem, because of the house of the Lord I will seek thy good." In 1845 a presentation to Rev. Dr. McGill, on occasion of leaving for Montreal, of breakfast and tea set of massive silver. To this are signed 64 names, of which now living are Thos. Elliot, Andrew Carnochan, Jas. McFarland. It is singular that while Montreal gave a minister to Niagara in its early days the chief city of Canada was now indebted to Niagara for an able preacher. The present manse was built by Dr. McGill, and purchased from him with legacy of Mr. Young, as the handsome pulpit was the gift of Mr. Young.

Among the names signed in 1850 to the call to Rev. J. B. Mowatt, now professor of Hebrew, Queen's University, now living are only Jno. M. Lawder, Jas. G. Currie, Jas. M. Dunn, Jno. Currie, Andrew Torrance. The memory of Rev. Dr. Mowatt is yet cherished in Niagara. In 1851 is noticed the very handsome sum paid in to support of church by non-commissioned officers and privates of Royal Canadian Rifles here, who attend St. Andrew's. In 1852 is purchased a bell; having enjoyed the use of one for nine years, 1804 to 1813, they were without one for almost forty years. In 1854 a Glebe is purchased with £150 offered by Clergy Reserve Commissioners, they afterwards raised £50 to complete the purchase. In this period the church twice sustained serious injury from storms, the roof being taken off and other damage sustained.

Of the names signed to call to Rev. Chas. Campbell in 1858 we have a startling commentary on the slow but sure approach of death, of 68 names only four persons are now living, Jas. M. Dunn, Jno. Blake, Thos. Elliot, Robt. Murray. Having now come to comparatively recent times we may fitly close with an extract from the records of St. Andrew's, on the death of Wm. Duff Miller, which goes on in stately periods thus,

"who for the long period of half a century had been a most valuable member, taking on all occasions a deep interest and acting a faithful part in the temporal and spiritual affairs of the church, being one of that little company of excellent Christian men (himself the last survivor) that during a lengthened probation of trial and suffering arising chiefly from the want of regular ministerial services, managed and kept together the Presbyterian congregation of Niagara when in the year of our Lord one thousand eight hundred and twenty-nine, their laudable efforts were at last rewarded, by the church of Scotland's ordaining and inducting a minister to the pastorate; the deceased, the following year on the completion of the ecclesiastical organization of the congregation to church ordinances, was ordained to the Eldership, which office he worthily and actively filled to the day he rested from his labors."

Yes, these pioneers of St. Andrew's and St. Mark's did noble work, after life's fitful fever they sleep well. May those of the present day not prove degenerate sons of such noble sires, but in the duties of every day life write history so that those of a day as far advanced on the light and civilization of ours as this is of the days of which we have been giving the record may say of us, "they did what they could."

FORT GEORGE'S LONELY SYCAMORE

A REMINISCENCE OF NIAGARA.

The story of a tree that rears
  Its form o'er an historic plain,
The sights it sees, the sounds it hears,
  That story's gay or sad refrain.

O lone tree on the rampart's height!
  What hast thou seen, what canst thou tell,
Of peaceful watch or desperate fight,
  O lonely, lonely sentinel?
But tell me first, what sweet, fair sight,
  Extending far and wide before,
Thou seest from thy vantage height,
  O lonely, lonely sycamore.

Afar, the lake spreads like a sea,
  And near, the river, broad, blue, deep,
Its waters flowing silently,
  As resting from their frantic leap.
Nor distant far, the mountain crowned
  With column pointing to the sky,
While all forgot the humbler mound,
  Where other heroes mouldering lie.

A skirt of oak in nearer view,
  And hawthorn, white with fragrant bloom,
And tall sweet-briar, wet with dew,
  Wild flowers with many a nodding plume.
Beneath the hill the children bring
  Their little cups, and eager press
To drink the water at the spring,
  Where grows the tender water-cress.

In front, a plain of changing hue,
  In winter white, now bare and brown,
Or grassy green, with herds in view,
  And to the west, the quiet town.
Beyond, the fort and beacon light,
  Old Mississagua's square grey tower,
On either side church spires rise bright,
  O'er stately home or humble bower.

Beneath, the crumbling ruins old,
  Where first our hero Brock was laid,
With funeral pomp in death-sleep cold,
  And tears were shed and mourning made
For him, who, with the morning sun,
  Went from these walls, erect and brave ;
The evening saw *his* victory won,
  A hero's fame—a soldier's grave.

Here, where the bank falls sheer and steep,
  The Half-Moon Battery may be traced,
Alike commanding shore and deep,
  A scar of war not yet effaced.
A path o'er-arched with trees we gain,
  Nor did it all their dreams suffice
To call that path the " Lover's Lane,"
  The grove around was " Paradise."

Nay, call it not their partial pride,
  Where can ye find a spot so fair ?
Italian suns have scarce supplied
  Such sky, such stream, such beauty rare.

Tell us the sounds that come to thee,
  Borne by the breezes as they fly,
The shout of schoolboy wild set free,
  The sportsman's gun, or plover's cry.

Or lover's fondly-whispered vows,
  The roar of guns in mimic strife,
The rustling of the forest boughs,
  Or varying sounds of human life,
The bugle's call, so clear and sweet,
  From neighbouring fort by breezes blown,
Gay laughter when pic-nickers meet,
  Or on the beech the wave's wild moan.

The quiet dip of idler's oar,
  The sweetly solemn Sabbath bell,
The distant cataract's softened roar,
  All these, oh, lonely sentinel.
Or wilt thou tell of nations four,
  Alternate owning this fair spot?
Thou knowest much historic lore,
  Then tell thy tale; refuse us not.

Or is it far beyond thy ken
  When Indian wigwams here were seen,
And red men roamed o'er fell and fen,
  And trail or war-path followed keen?
Didst see the brave La Salle pass on
  To seek the Mississippi's wave,
And how, ere Abram's heights were won,
  Yon fort was won—won many a grave?

Ere gallant Frenchmen yielded here
  To Britain's power their heritage,
Johnson, the red man's friend held dear,
  Thou saw'st successful warfare wage.
The loyal refugees here press,
  Leaving their lands, their homes, their all,
Deep in the solemn wilderness,
  To hew new homes at duty's call.

And here our country's fathers met
  In humble legislative hall;
But soon arose day darker yet,
  When foeman held these ramparts all.
Then came a day of fear and dread
  When winter snow robed dale and down;
And mothers with their children fled
  In terror from the burning town.

But soon returning peace brought round
  More prosperous, happy, golden days,
And from the shipyard came the sound
  Of hammers beating songs of praise.
Those days are gone ; gone, too, we fear,
  The busy mart the live-long day,
Nor sound of vulgar trade is here,
  And " Lotos Town " they sneering say.

But no—thy life's a shorter span ;
  Thou canst not all the secrets tell
Of brave, or rash, or erring man,
  O lonely, lonely sentinel.
Where once the pagan rite was seen,
  Or French or Indian warlike bands,
Where fratricidal strife had been,
  Two Christian nations now clasp hands.

Long mayst thou stand, O stately tree,
  Outlined as boldly 'gainst the sky ;
As thou hast often gladdened me,
  Cheer other hearts as years pass by.
As from my window now I gaze,
  Thinking of many a ramble wild,
With friends of other, earlier days,
  Far past thy fort with walls earth-piled,

I send a wish and prayer that thou
  Mayst live to see and live to tell
Of brighter days than even now,
  O solitary sentinel.
May other school girls love thee well,
  They surely cannot love thee more,
And be thou long their sentinel,
  O lonely, lonely sycamore.

JANET CARNOCHAN.

Niagara.

DIARY OF GOV. SIMCOE'S JOURNEY FROM HUMBER BAY TO MATCHETACHE BAY, 1793.

[The writer of the following interesting account of the above journey was the late Hon. Alexander Macdonell, one of the best known of the early citizens of Toronto. He was born in 1762, at Fort Augustus, Invernesshire, Scotland, and was the son of Capt. Allan Macdonell, who with his family and other relatives emigrated in 1773 to the Mohawk Valley, in the then British Province of New York. When the Revolutionary war broke out in 1776, the Loyalist Scottish settlement, to which the Macdonells belonged was disarmed, and Capt. Allan Macdonell was, with others, imprisoned as a hostage for the neutrality of his kinsmen and neighbors. Sir John Johnston and a number of the other settlers on the Mohawk, in May 1776, started to traverse the wilderness lying between them and Montreal, and in nineteen days reached their destination after undergoing the greatest hardships. Of these Loyalist pioneers young Alexander Macdonell was one. He soon afterwards, at the age of sixteen, enlisted as a cadet in the "Royal Highland Emigrants," subsequently numbered the 84th Regiment. After several years of active service he was transferred to "Butler's Rangers," and as a member of this famous corps he took part in many stirring military episodes. After the conclusion of the war, Capt. Allan Macdonell and his family received grants of land in Canada, then the Province of Quebec, and they resided near Quebec city until the father's death, which took place shortly after their arrival. Mrs. Macdonell and her family moved to Kingston, and afterwards to Newark, now Niagara, when it became the capital of the new Province of Upper Canada. Governor Simcoe, who had himself been a British officer in the Revolutionary war, and had in that capacity become acquainted with Alexander Macdonell, appointed the latter Sheriff of the Home District, which included both Newark and York. As a trustworthy member of the Governor's suite he accompanied him on the trip described in the diary subjoined. Sheriff Macdonell represented the Glengarry district for some time in the Legislative Assembly of Upper Canada, and was at one time Speaker of the House. When the war of 1812-14 broke out he was appointed Deputy Paymaster-General, with the military rank of Colonel, while his cousin and *protégé*, John Macdonell of Glengarry, joined the staff of General Brock, with whose remains his, and his alone, lie interred under the monument on Queenston Heights. Col. Alexander Macdonell was taken prisoner at the capture of Niagara in May, 1813, and was detained till the close of the war at Lancaster, Pennsylvania, where his father had been kept a prisoner in 1776, as narrated above. After his return to Canada he held various public positions, and was in 1831 created a member of the Legislative Council of Upper Canada. An active and earnest member of the Roman Catholic church, he rendered great assistance to his cousin, Bishop Macdonell, in building up that religious community in this Province. In 1818 he erected the still prominent residence on the Northwest corner of John and Adelaide streets, and at his hospitable table most of the eminent men in the Province were at one time or another entertained. He was tall and commanding in figure, but quiet and somewhat reserved in manner, and could talk fluently in the Gaelic, French, and Indian tongues. Colonel Macdonell died in his own residence in 1842, leaving behind him five sons, one of whom, Mr. Alexander Macdonell, now Clerk of Process at Osgoode Hall, has long been the careful custodian of the diary here printed for the first time. The Historical Section of the Canadian Institute has passed a resolution thanking Mr. Macdonell for permission to print the diary, and respectfully requesting him to have it placed for permanent preservation in one or other of the public libraries in Toronto.]

1793. September 24th.—Lieutenant Pilkington of the R. E., Lieutenant Darling of the 5th Regiment, Lieutenant Givens of the 2nd Rangers, and

W. Aitken, D.P.S., with two Lake LaClaie and two Matchetache Bay Indians, embarked in a batteau, and went that night to Mr. St. John's, on the River Humber.

25th.—Got up at daybreak to prepare matters for our journey. His Excellency, Lieutenant-Governor Simcoe, joined us from York. We shortly afterwards were ready and entered the woods, keeping our course about N.N.W., crossed a long pine ridge. About one o'clock, dined upon a small river which empties itself into the Humber, and, to make the loads lighter, took the bones out of the pork. After dinner, re-loaded our horses and pursued our journey. About four o'clock, it beginning to rain, we encamped on the side of the Humber, at the west extremity of the 3rd concession. We here got some wild grapes and a quantity of crawfish.

26th.—At eight o'clock continued our journey. In the early part of the day, went over a pine ridge; but from ten till six in the evening, when we encamped, went through excellent land for grain or grass, the trees uncommonly large and tall, especially the pine. Crossed two small creeks which emptied themselves into the Humber, on one of which (Drunken Creek) we dined, and encamped on the second. The land through which we passed is chiefly wooded with maple, bass, beech, pine and cedar. During this day's march we passed the encampment of an Indian trader, who was on his way to his wintering ground on Lake LaClaie.

27th.—Proceeded on early in the morning. Shortly after leaving our fires went through a ridge of very fine pine, which appeared to be bounded by a deep ravine to the north. After crossing in an oblique direction the pine ridge, went over excellent land, black rich mould; timber, maple, beech, black birch, and bass. Crossed a ravine and ascended a small eminence of indifferent land. This height terminated in a point, and a gradual descent to the River Humber, which we crossed. We dined here, and remained two hours to refresh ourselves and horses. While at dinner, two men with two horses, who left the end of the carrying place in the morning, met us. They were going to bring forward the trader which we passed the preceding day, and his goods. After dinner proceeded on. Went over very uneven ground, the soil in some places indifferent, but in general not bad land. Saw some very fine yellow pine and black birch. About six o'clock came to the end of the carrying place and encamped. Here found Mr. Cuthbertson, Indian trader, and owner of hut we passed the day before, encamped.

28th.—After breakfast, Messrs. Givens and Aitken, with two Indians and two white men, went up the river for three canoes which had been previously provided for the Governor, and I went with three rangers to

erect a stage near the river to put the pork, &c., on when brought down from the encampment. Having accomplished this, upon our return we cut a few trees to make a bridge upon a bad pass in the swamp. Returned to camp about two o'clock, and shortly afterwards to the stage with seven of the rangers, all with packs which we put upon the stage. We here met Messrs. Givens and Aitken, having returned with the canoes. The whole then returned to camp only me, who remained to take care of the baggage. In about two hours the whole came down, and we immediately embarked into five canoes, viz., the Governor, Mr. Aitken, an Indian, and two rangers in one; Messrs. Pilkington and Darling, with their two servants, in the second; Mr. Givens and two Indians in a third; an Indian and two rangers with me in the fourth; and Mr. Aitken's surveying party in the fifth. We dragged our canoes till we came to the river, over a part of the swamp where it would be impossible to walk without their support, it being a quagmire, the skin or surface of which was very thin. Proceeded about a mile and a half or two miles along the river, which in this short distance has several turns. Went about a quarter of a mile up a smaller river which empties itself into the former, and encamped. Soon after making our fires, the Great Tail and his family (Messessagues), who were encamped further up the river, came to visit their Great Father, the Governor, to whom they presented a pair of ducks, some beaver's meat, and a beaver's tail. His Excellency gave them some rum and tobacco.

29th.—Embarked into our canoes in the same manner as the preceding day, paddled down the river, which is a dead water, bordered on each side with quagmires similar to the one we hauled our canoes over. About two hours after leaving camp, Mr. Givens came into my canoe and the Indian went into his; but our canoe made much water and we could not keep up with the others; we shortly after got the Indian back again. At twenty minutes after one we entered Lake LaClaie, now Lake Simcoe, so called in memory of Captain Simcoe of the R. N. At the entrance of the lake we saw two canoes, who upon seeing us paddled off to their village, which was upon a point about four miles off, to apprise them of the Governor's arrival. We paddled on towards the point and passed the village close in shore. The Indians who were by this time assembled, fired a *feu de joie* to compliment His Excellency, which we answered with three cheers, and then doubled the point, and put on shore in a small sandy bay to dine. Soon after our landing the Indians came in a body to wait on the Governor, to whom they presented a beaver blanket, which he declined taking then, but promised to take it upon his return from Matchetache Bay. They were all more or less drunk and made rather an unintelligible speech. They got liquor from four Canadians who had been sent from Matchetache Bay by

Cowan, an Indian trader, to buy corn. His Excellency was sorry that he could not see Keenees, the chief of the village, with whom he was acquainted, as he was dangerously ill. We left our smallest canoe here, and got one Indian in lieu of the two Indians belonging to the village, who preferred remaining to proceeding on the journey. After dinner we re-embarked, and the wind being fair, hoisted sail, and about dark put on shore and encamped in a cedar grove about six miles from the village.

30th.—Left our encampment about ten o'clock. Mr. Givens was taken into the Governor's canoe, and in his place one of the rangers put into mine. Sailed on with a strong breeze about six miles, and it blowing too fresh to cross Kempenfelt Bay, put in at Point Endeavour, where we remained till two o'clock, and dined. After dinner, the wind moderating a little, we again hoisted sail and crossed the bay, which is between seven and eight miles deep and four and five wide. We had scarcely got over when the wind blew hard ahead, and it beginning to rain we encamped in a pleasa t spot on the side of the lake.

October 1st.—Embarked about eight o'clock, and having a contrary wind had to paddle against a head swell, which impeded our going much, and frequently dashed water into our canoes. Put in for a few minutes to take the bearings at a bluff point about six miles from our last encampment. This being accomplished we coasted close in shore for some time and, the wind abating, made for an island near the head of the lake, and landed there about two o'clock, and dined. This island, now Francis's Island is pleasantly situated, having a fine prospect of the lake. The Indians used to raise corn upon it, but have not for some time. It is quite covered with long grass. About two o'clock we embarked, and shortly after leaving the island entered a small straight, near the far extremity of which we saw two Indians in a canoe paddling across. So soon as the Indian in the Governor's canoe perceived them he gave the death hallow; the strange Indians made for land, and we, seeing the wigwam, followed. So soon as our Indian got near enough to be heard he made a melancholy detail of the number of deaths that had lately happened among the Lake Simcoe Indians, and closed his speech with saying "that the end of the world was at hand, Indians would be no more." An old Indian, owner of the wigwam, gave a similar unpleasant account of the great sickness in his neighbourhood also, and added that he expected his eldest son would soon change his climate, and that nothing but his being unwell prevented his going to his wintering ground. His Excellency made this family a small present, and we parted. Soon after leaving them, the wind turning fair, we hoisted sail. At this place the lake widens, and is interspersed with small islands, on some of which the Indians had planted corn, turnips and

squashes. About sunset got to the head of the lake, entered the river Matchetache, and encamped.

2nd.—Proceeded down the river, and in the space of two hours had to carry our canoes, &c., over two portages. A short distance below the first carrying place the Black River empties itself into the Matchetache, and changes the colour of that river from clear to a dusky brown, which it does not vary until it enters the bay of the same name, upon Lake Huron. Below the second carrying place the river widens, and at about a distance of six or seven miles from it we crossed a small lake about six miles in circumference. Put on shore and dined upon a point where we got various kinds of berries. Mr. Pilkington's canoe and mine being leaky were hauled out of the water and gummed well. After dinner pushed off, and about sunset came to a third carrying place, where, after hauling up our canoes, we encamped. This place is said to be much infested with rattlesnakes; it certainly has much the appearance of it, being almost a solid rock, with a few scrubby pines and oaks growing on it. John Vincall, of the rangers, cut one of his toes almost off here. To the left of the carrying place is a handsome fall, and below that an impetuous rapid.

3rd.—Had the canoes, &c., carried across early in the morning, and after breakfast proceeded down the river. Went through several rapids and crossed two more carrying places. At 2 o'clock arrived at, and had everything carried over a fifth portage. The scene of this place is pleasing and romantick; the portage is a solid, level rock with a few small pines and oak growing out of the rents. The falls rush, as may be easily conceived to be the case, from an immense body of water, having a great descent, and being condensed between two rocks, at not more than fifteen feet asunder. After dinner continued our journey, and soon after crossed a sixth portage. Shortly after re-embarking it began to rain, and we encamped upon a small island about two miles below the last mentioned carrying place.

4th—Loaded our canoes early in the morning and embarked. The wind being fair, hoisted sail, and in about three or four hours arrived at a seventh and the last carrying place. Having crossed our canoes, &c., and again re-embarking, at 11 o'clock we entered Matchetache Bay. The Indians being apprised, by an express across the country from Oakland Point, of the Governor's being near at hand, were assembled upon a point a short distance from the last carrying place. Upon seeing them we made towards them. When we got within a few yards of the shore they complimented His Excellency with a *feu de joie*, which we answered with three cheers, and immediately landed. After all the Indians had shook hands with the Governor, the chief presented him with two dozen ducks. His Excellency thanked him, and told him he would be happy to see him and his band

in the evening at Mr. Cowan's, on the opposite side of the bay. Re-embarked, and sailed across in little more than an hour ; it blew so fresh before we arrived that we were obliged to lower our sails. Upon landing, unloaded and hauled up our canoes, encamped in the woods a small distance from the lake, and about half a mile from Mr. Cowan's house, or rather fort, for it is a square stockade ; his house is in one, his store opposite to it in another, an out-house for potatoes, corn, &c., in a third, and the gate in the fourth. He does not allow the Indians to get drunk within the garrison. Soon after we had encamped the Indians arrived, and the Governor made each of them a present of tobacco. About eight o'clock, Mr. Cowan, who had been out hunting all day, returned. He sent His Excellency some ducks, and shortly afterwards came to pay his respects. Mr. Cowan is a decent, respectable looking man, and much liked by the Indians. He was taken prisoner by the French at Fort Pitt, during the war of '58 and '59, when a boy. He has adopted all the customs and manners of the Canadians, and speaks much better French than English. He has been settled at Matchetache upwards of fifteen years without once going to Lower Canada. He makes an annual trip to Michillimackinac to meet his supplies there and forward his furs to Montreal. He has in general six Canadians engaged with him, and is well known to that class of people by the name of Constant.

5th.—Mr. Cowan having been desired by the Governor the preceding evening to attend next morning to interpret, arrived after we had breakfasted, and the Indians being met, addressed His Excellency in the usual manner : "They were happy to see him in good health and thanked him for taking the trouble of visiting them in their own country, &c." The Governor replied that he would always be glad to hear of the prosperity of the Indians, and entreated them to attend to their hunts, and told them that he wished for nothing more than seeing them and his children, the whites, live in harmony together, and mutually assist each other. He promised them a keg of rum which should be delivered to them the day of his departure from the bay, and told the chief he would send him from York a silver medal and a flag, the usual badges of distinction which this chief had not as yet received. They then shook hands and went off well satisfied. I must here observe that the Lake Simcoe Indians were much mortified at the Governor not taking the beaver blanket when offered to him. This they communicated to the Matchetache Indians by the express which went overland ; and they simply replied that their father did right not to take it, that they should have made his bed upon his arrival at York (as they did), and not waited for his arrival in their village. The Matchetache Indians had made his bed at York by presenting a beaver blanket.

Soon after the departure of the Indians, His Excellency, Mr. Cowan, and the gentlemen of his party embarked in one of Cowan's large canoes, worked by five Canadians, (leaving the rangers, &c., at the encampment) intending to visit Penetanguashin, a place supposed to be a good harbour for vessels. The wind blew so fresh that we could not effect our purpose, especially as we had a wide traverse to make. We, however, landed upon an island called by Mr. Cowan, "Place la Traverse." We got to a point opposite to it, and had an ample view of it, and from its appearance and the account Mr. Cowan gave of the depth of water, I believe His Excellency was satisfied with its sufficiency for the reception of vessels of eighty or ninety tons. To judge from the wood, the land about it seemed to be very good. It lays about six miles within Matchetache Bay, and nearly nine miles from Mr. Cowans'. We walked a mile and a half or two miles further, and had a fine view of Lake Huron, then returned to the canoe and dined. After dinner reembarked, the wind beieg fair, hoisted sail and arrived at our encampment about an hour after sunset.

6th.—Between nine and ten o'clock left our encampment, launched our canoes, and set off on our return home. Put in at the point where we had met the Indians on the morning of the 4th instant, and His Excellency gave them the keg of rum agreeable to his promise. After some little ceremony on their part in wishing us favorable weather and a clear day, &c., we pushed off from shore, upon which they saluted as they did the day we arrived in the bay, and we answered as before with three cheers. Paddled on and soon arrived at the carrying place; brought everything across and without halting pursued our journey, went about five or six miles further on, and landed upon an island. One of our Indians getting sick, Mr. Givens, with a white man and the other two Indians, returned to the point to bring back the sick man and get another in his place; but before they got down, the Indians on the point had paid their devoirs so very attentively to the rum keg that they had not the use of their limbs or reason. Finding that none would come with him, and expostulation being vain, he put the sick man on shore, pushed off, and joined us in the evening. Finding it too late to proceed after Mr. Givens' return we encamped where we were.

7th.—Got everything on board before sunrise. In consequence of our losing an Indian the preceding day, the one that was in my canoe was removed to the Governor's, and one of the rangers sent in to mine in lieu. Paddled up the river and got over two carrying places, upon the second of which we breakfasted, the same on which we dined on the 3rd. After breakfast His Excellency and the gentlemen of the party crossed to the opposite side of the river to view a fall which could not be seen from that we were upon. Having satisfied our curiosity we recrossed, embarked

into our different canoes, and pushed off. Crossed two more carrying places, upon the second of which we encamped about sunset, the one upon which we slept the night of the 2nd.

8th.—Some of the canoes being leaky were here gummed, after which we got on board, paddled pretty hard, crossed the two remaining carrying places, and half an hour before sunset got to the head of the lake, and encamped on the spot we had occupied on the 1st.

9th.—Embarked after breakfast, and having paddled against a head wind and swell arrived at Francis' Island at twelve o'clock. His Excellency did intend going from this island round the opposite side of the lake to what we had come, but finding only four days' provisions remaining, and not knowing what time it would take us by so doing, he judged it more expedient to return by the way we had come ; therefore, after dinner got on board, crossed to the main land and before sunset encamped where we had slept on the 30th of September.

10th.—Got into our canoes before sunrise, being fearful that we would have the wind ahead and wishing to cross Kempenfelt Bay before it blew too hard. Our apprehensions were confirmed. The wind began to rise, but we luckily got over the bay before the lake was too rough. Put on shore and breakfasted at Endeavour Point. Re-embarked and coasted along shore. At one o'clock put in, and dined about two miles' distance from the village. Having dined and got on board we paddled on and soon came abreast of the village. The Indians fired a *feu de joie*, and we gave three cheers. Got round the point, put on shore in a small bay, hauled our canoes on shore and encamped in the rear of the village. While we were making up the fires and preparing everything for the night, His Excellency humanely went to pay a visit to Keenees, the chief, who, as I have already mentioned, was dangerously ill when we passed on our way to Matchetache Bay, but on his getting to his wigwam he was informed that he had been dead for some days. A man possessed of less sensibility and feelings than the Governor would have been shocked on this occasion, but his were plainly painted on his countenance upon his return to camp. About six o'clock a number of squaws came to visit the Governor. Two of them carried the images of their deceased husbands, dolls about two feet long decorated with silver broaches, feathers, paint, &c., if a chief, as was the case with one of these (Keenees), his medal is hung to his neck, the face painted black. His Excellency gave them some knives and looking-glasses, and shortly after they retired. At 8 o'clock the Indians came in a body, and being seated around the fire each got a dram and a piece of tobacco, after which the chief got up, thanked their Great Father, and presented him with the beaver blanket, which he spread under him. He

then said: "You white men pray; we poor Indians do not know want it is, but we hope you will entreat the Great Spirit to remove the sickness from amongst us." To which the Governor replied that they should certainly be remembered in the prayers of the whites. He then ordered them a keg of rum, and they went away perfectly happy, and highly pleased that the blanket was accepted, and that they had made their Father's bed.

11th.—About 9 o'clock left our encampment, embarked, and soon got out of the lake, paddled up the river about three miles, and then got into another river, and about two o'clock got to the landing place at the red pine fort. His Excellency finding that John Vincall, the man who cut his toe on the 2nd, could not walk, desired Mr. Givens, his servant, and me to remain with him, and that upon his arrival at York he would send a horse to meet us at the old carrying place, for the man to ride; therefore after dividing our little stock of provision and dining together we parted; the Governor and the rest of the party going to York by a new route, Givens, McEwen, Vincall, and myself remaining. It beginning to rain we encamped there that night.

12th—Got into our canoe before sunrise, paddled down the river till between 8 and 9 o'clock, then put on shore to eat breakfast, which having done, re-embarked and made the best of our way to the place where we had encamped on the night of the 28th of September, which we reached about sunset. Saw many ducks, but so wild that we could not get within shot of them; killed only one mud hen.

13th—Mr. Givens and his servant went out very early in the morning to hunt ducks. Vincall and I remained behind to pound and boil Indian corn for our breakfast. They returned about two o'clock with two ducks only. About half an hour before sunset Mr. Givens and I went up the river to get some birch bark to make torches with to spear fish. On our way up fired repeatedly at ducks without any success; killed one but could not find it. Having put on shore about two miles up the river and got a sufficiency of bark returned to our encampment at 8 o'clock.

14th—Got up at day break, and while preparing to go to hunt found that we had but two quarts of corn, and a small piece of pork remaining. Mr. Givens and I therefore resolved to go back to the Indian village, to get some supplies. After eating about a pint of corn and a small piece of pork embarked into our canoe, and shortly after leaving camp, the wind being fair, hoisted sail. We were very soon after forced to lower it, as it blew too fresh; cut off about two feet of the mast, reefed the sail, and hoisted it again. We shortly after met the Great Tail and his family in two canoes

going to their wintering ground. We gave him some powder and shot; he gave us two ducks, and promised to take care of our men until we returned. Sailed on, and near the entrance of the lake we met two canoes with two Indians in each. Got eight ducks from them for powder, shot, and a looking glass. Hauled the canoe on shore, made a fire, and gum'd her. Having made her as tight as we could, we again pushed off, hoisted sail and, passing the village, landed in the bay where we dined on the 29th September. Hauled the canoe on shore, turned her upside down, and made a fire. It being late when we arrived we had not time to get much wood, had scarcely sufficient to broil two ducks for supper. It beginning to rain, and the wind shifting suddenly about, we were forced to carry our canoe, &c., to the opposite side of the fire, and turned our backs to the lake. Crept under the canoe, and passed a very uncomfortable night.

15th.—Early in the morning three squaws came down to gum our canoe, and the Indians bartered as much corn with us as we wanted. It blew so hard that we could not possibly set out on our return, and it being too cold to remain on the beach went further into the woods to encamp. We lamented much not being able to return to our men, the more so as they had but a scanty allowance of provisions when we left them, although we took none from them. About two o'clock we broiled a couple of ducks, and breakfasted. Shortly after two squaws came down to our fire with more corn to sell. We told them we had enough to bring us home and wanted no more, that we were chiefs, not traders. We gave them a few broaches and some ribbon, and desired them to carry their corn home. In the evening two more came on a similar errand, and we made the same reply as to the former two. They brought us a sufficiency of fire-wood, for which we gave each a ribbon. They then left us, and we had no more offers of corn to barter. Being sleepy we went early to bed, but were both too unwell to get any rest.

16th.—Got up at daylight, tho' still very sick, but, seeing the necessity of returning to our men, launched our canoe, put everything on board, and pushed off to go to Mr. Cuthbertson's (an Indian trader), on the opposite side of the lake. Putting the canoe in the water was a disagreeable task, as it had frozen hard the night before and was then so cold that the water froze upon our paddles, About half way over to the trader's Mr. Givens got so very sick that he could not paddle, and as I was also unwell and not able to work now, we were a considerable time in getting across. Upon our arrival Mr. Cuthbertson received us very hospitably. He gave us chocolate for breakfast which revived us. Finding that in our then situation we could not bring the canoe up by ourselves we hired an Indian, and Mr. Cuthbertson let us have one of his men to help us. Having got a

gallon of spirits from him we started. Soon after embarking we found the canoe still leaked, therefore put on shore at the Indian village, hauled her up and gummed her. We saw there only one old squaw and a boy, all the rest having gone off that morning to their wintering ground, and they were soon to follow. At 12 o'clock left the village. When we came to the forks of the river we saw an eagle sitting on a muskrat house. The Indian in the bow fired, but in vain, being only loaded with duck shot. At eight o'clock we reached our encampment, and tho' we were apprehensive that our men had suffered during our absence we found upon enquiry that they had fared much better than we had, the Great Tail having supplied them with duck and Indian corn.

17th.—A little after sunrise Mr. Cuthbertson's man and the Indian parted with us. We gave them our canoe to bring them back. Soon after the Great Tail (who had encamped on the opposite side of the river) paid us a visit, and brought us four duck. We thanked him for the care he had taken of the men in our absence, and told him that it would please their and our father at York, as he wished for nothing more than such mutual good offices between the Whites and Indians. This being the sixth day since we parted with the Governor, and the day by him appointed for our crossing to the beginning of the portage, we provided corn for two days, borrowed a canoe from the Great Tail, and embarked. We soon reached the stage which we had erected on the 28th, and in two trips carried everything up to our old encampment. When we returned to the stage the second time we there met two of the Great Tail's sons, who came to bring three more duck and bring back the canoe we had borrowed. We gave the boys a few yards of ribbon each, and had given their father at parting in the morning all the powder and shot that we could spare. They were satisfied and we were pleased. Soon after encamping and putting on the fire a kettle full of Indian corn and a few ducks for our supper, Sergeant Mailey and another man of the Rangers, guided by one of the three Indians who went with His Excellency (the other two remained behind them a short distance) arrived from York with a horse for the lame man. The Governor was pleased to send us by them brandy, wine, tea, sugar, pork, and bread. We made a hearty supper, and concluding the evening with a can of grog to his health, went to bed.

18th.—The horse being missed two of the men were sent in search of him, but returned unsuccessful. The Indian was then sent and in a very short time found him. Packed everything up; made our packs, and when ready to start the two remaining Indians arrived. Parted with them at eleven o'clock and marched on. At four o'clock arrived at

the Humber, crossed it and encamped, the horse being too much fatigued to proceed, having had a forced march the preceding day.

19th—Tho' it rained all the night before, set out at daylight. At 12 o'clock halted at the creek where we met the trader's tent on the 26th, and breakfasted. At one o'clock continued our journey and at three came to the spot where we had encamped on the 25th, stopped for about a quarter of an hour, then pushed on and arrived at St. John's a little past four in the evening, and slept there that night.

20th.—Left St. John's after breakfast, and arrived at the camp at York at ten o'clock, having been absent 27 days, without any accident happening, excepting Vincall cutting his toe.

ARSENIC AND SULPHUR AS METALLURGICAL AGENTS IN THE TREATMENT OF CANADIAN AURIFEROUS AND ARGENTIFEROUS ORES.

By R. Dewar.

(*Read 13th March, 1890.*)

We are all too well aware of the direful results on amalgamation caused by the presence, in the ore operated on, of arsenic and more especially sulphur, as their capacities for neutralizing the mercury and thus rendering it useless to hold the gold or silver that passes over it, are very great. These troublesome elements are got rid of at the present time by roasting, but this causes expense, and metallurgists even hint at a loss of the precious metals by this treatment. I differ with them so far as to say, that if there is any loss, which there may be, the same is so minute that practically there is none.

The chlorination process as it is variously applied according to the different patents granted for it, has a drawback in the treatment of these ores, in its restriction to those only in which the metals are in a state of fine division, therefore in ores like some of ours in which the metals are in larger bodies, it is rendered useless; but in any case the ores must first be roasted to get rid of the arsenic and sulphur, as they form troublesome salts with the chlorine. Now, it is quite apparent that if part of the treatment could be dispensed with, it would be the means of increasing the returns in a great many mines at present in operation. Why then could we not dispense with the chlorination, and do the work with the roasting alone? It may seem impossible at first as the roasting is merely a preliminary to the chlorination which is the principal.

There is a law of metallurgy which has been greatly neglected, and I may say has not been paid the attention or given the research due to it. That law expressed is that when a metal is alloyed with one or more of the other metals, the resultant alloy has a lower melting point than the mean of the several melting points of the constituents taken together. Let us take an example, for instance, an alloy of 1 part lead, 1 part tin, and 2 of bismuth, the melting point of lead is 325°C, tin 227·8°C, bismuth 259°C; their sum is 811, their mean, 270°C. This will melt at 100°C, which is just 170°C below the mean. Is this not sufficient proof for this law? Let us take another example, that of an alloy of lead and

platinum. Platinum does not melt even in the highest temperatnre obtainable in a blast furnace, but only in the flame of the oxyhydrogen blowpipe, and the calorific intensity of oxygen burned in hydrogen = 3,154°C. Now if we take for granted that the heat absorbed by the nitrogen of the air is equal to the extra heat generated by the blast caused by the forcing of the gases through the nozzle, which consequently causes a more rapid combustion, hence a higher temperature, these figures represent the blowpipe flames' temperature, hence the melting point of platinum. Those calculations of mine are not mathematically correct to the fraction of a degree or so but are quite accurate enough for our purpose. Now the melting point of lead added to that of platinum = 3479, therefore the mean = 1739°C. I have melted such an alloy at 1000°C, that is 739°C below the mean ; is this not a magnificent example? This law is confined to no special one but holds good for all alloys.

Why, then, if this is a general law of alloys, is it not applicable in the case of arsenic, sulphur, silver, and gold? You will object that arsenic and sulphur are not metals proper. That is quite true of the sulphur but not so of the arsenic ; but still that would not incapacitate them to form alloys with the metals. They may either be as a salt, such as a sulphide or arsenide, or be in molecular proportion to form chemical compounds, or in excess or deficient for such, and only form mechanical mixtures, or one contained in solution in another, or in an allotropic state ; but still they are alloys and in proof of this we have only to look at shot lead, which is an alloy of arsenic and lead ; copper also alloys with arsenic as a greyish brittle metal ; and has not galena the resemblance and properties of an alloy ?

In consideration of this I hold that arsenic, sulphur, silver and gold do alloy and that therefore the temperature at which they melt is lowered in virtue of their being alloyed with the sulphur and arsenic.

In accordance with this, we will now consider the following data :—

As—melts at 220°C. We will say that although it oxidises at that temperature, therefore its melting point must be lower.

S—melts at 115°C.

Au— " 1102°C.

Their sum is 1,437, their mean, 479°C ; therefore this would seem to indicate the melting point of this alloy. This corresponds to a temperature below incipient red, as it is according to Pouillett 525°C, dull red being 700°C. I do not mean to insinuate that gold alloyed with arsenic and sulphur will be reduced to such a ridiculously low melting point, but I do

mean to say that it is lowered considerably, as I have melted them at about an incipient cherry red, corresponding to a temperature of about 800°C, and perhaps a few degrees lower, so that I can vouch for it as being correct. If the melting point of silver be added, namely, 1023°C, the sum will = 2460, the mean, 615°C. I may say I have melted them at such a temperature and below it.

Many of our ores carry sufficient S and As for this law to be taken advantage of in their treatment; but before we can see in what way it would be advantageous to us, we must consider another law. That law is namely the spheroidal form given to small portions of metals or alloys under three different modes.

This is a law which none of the works as yet published on Metallurgy have mentioned, and I don't think that any of our profession have paid any attention to it, and that some are even ignorant of its existence. We shall consider the modes under which this form is given.

1st. When metals in a thin body or sheet, such as gold leaf, are exposed to certain temperatures the sheet breaks up and forms into globules. This may be proven by taking any gilded work, say for instance on wood, and placing it on the lid of a furnace or common stove. When the wood begins to char the gold will be seen to form into globules. This is caused directly by the heat.

2nd. When certain metals are alloyed with others, they cause a shrinkage concentrated to a certain spot, which acts as a nucleus around which another portion of the alloy forms a globule when cast upon a cold surface, into water, or when pressed from under or through a crust of part of the alloy solidified. This is caused, 1st, by one of the constituents cooling more quickly than the rest. 2nd. When one of the constituents has a greater shrinkage power than the other.

We can again take shot lead into account. As I have said it is an alloy of arsenic and lead. Arsenic is of nature a great shrinker or contracter, and thus it is used to give the rotund form to the lead, as it causes it to contract when it touches any solid body and form a ball. We may further prove this law by taking an alloy that is known to shrink, melt and cast into an open mould, let the top solidify, strike it two or three gentle taps with a hammer or die, having a broad striking surface, when the metal will be seen to force its way up through the crust and form globules on the surface.

The 3rd mode really belongs to the former two, but we will consider it as an independent one. It is the action of the atmospheric pressure in the promotion of a spherical form in molten metal, when in small

quantities. It is the best known law of Hydrostatics that a fluid will flow until it finds its level; but pour water on any highly heated surface and instead of flowing until it finds its level and keeping in a body, it will break up into little globules and either roll about or stand still, until the atmospere in its vicinity is cooled sufficiently, when it evaporates in steam.

The same may be said of the metals with a little modification, the surface will do as well if it is cold, and not so well if it is at too high a temperature, unless there be a good supply of cold air playing on the surface; but it all depends on the melting point of the metal and the rapidity with which it cools. On studying this I have come to the conclusion, that the heat radiated from the metal or alloy heats the air in its vicinity, that by the law of gravitation, the heated air having expanded and thus having a lower density than the cold air, ascends to make room for the same, that the rapidity with which it ascends partly breaks the equilibrium of the atmospheric pressure, that the pressure being less on the upper surface it is inclined to rise and thus partly kept from spreading or finding its level, that it is aided in this by a lateral pressure, if I may so express it, which is not disturbed by the ascension of the heated air. That this is true may be seen by a great many metals when cooled suddenly by artificial means, or not formed into globules until on the point of solidifying, they will be seen to have their tops (the globules) very much flattened; this shows at once that it is the exertion of the atmospheric pressure, as if they had been hot or not cooled so suddenly, their tops would not have been flattened.

Why then could these laws not be applied in the metallurgical treatment of our gold and silver ores? The sulphur and arsenic would assist to lower the temperature at which they melt, by alloying with them and any portion that did not combine with them would act as a flux. I need not extol the virtues of such a flux, it would collect any fine gold and bring it in conjunction with more, forming a globule, while at the same time the sulphur would act as fuel and produce heat, the arsenic according to its nature would cause any body of metal it happened to be in to shrink and form a globule, thus all the fine and leaf gold would be collected into bodies large enough to be easily worked, and this could be done by roasting, but not roasting as is practised at the present day, as arsenic and sulphur are considered a disadvantage and it is to get rid of them that it is practised. Allow me to quote a passage from Overman, the late American metallurgist, as it will show us the object of roasting as it exists; he says, "Roasting means to heat a metallic ore or matte to at least a red heat or such a heat that the mineral does not melt but only

the volatile or combustible substances are expelled and as much oxygen becomes combined at the same time with the ore as it possibly can absorb." But we are aware of the weak affinity of the precious metals for oxygen, they are therefore reduced direct to the metals. In accordance with this he says further on, that "Sulphuret of Silver is easily liberated from its sulphur and forms metal; the same is true of gold." Roasting was resorted to but very little in the treatment of ores of the precious metals until lately, and even where it is used the benefit that might accrue from it is lost by restraining the temperature from rising above a certain point, for fear of sintering and thus causing extra expense in the working of it.

Well, to go into detail of how I intend to roast these ores. They must either be roasted in piles or kilns. I prefer the pile as a larger portion of ore can be operated on at once and more easily manipulated than if in kilns, and there is also very little outlay in preparing the bed to receive the same; but it all depends on the metallurgist who is considering the question, as one man can see an advantage where another could not. I shall go no further into details than to say that the pile will be merely the ordinary one, with special attention paid to its draught canals which shall be two feet apart. We shall commence by building up the foundation from 18″ to 2ft. in height, of hardwood, the height it is to be built depending on the amount of sulphur contained in the ore, the more sulphur the less fuel, and *vice versa* for the other extreme. The top should be easily reached so that the fines that form the covering could be easily manipulated. When the pile is all ready for lighting, we shall light it at one end only and not all round as is usually done, as the fire will spread soon enough for our purpose. When the end is well lighted let it have the benefit of a full draught by opening four draught canals (2 on each side), and clearing the fines of the top, for four feet, when the ore having this great draught will sinter; when it has pretty well sintered, turn three or four jets or streams of water on it, this will cause it to crack and crumble, then let men with long iron hooks pull the crumbling parts away so that the water may the better get at the other parts, and keep continually clearing away as it is possible to do so; when within one foot of that part of the pile, whose draught canals are not open, stop putting on water, open two on each side, pull fines off top as before, let sinter, put on water, and pull and clear away as ready, repeating this until the pile is finished.

The ore which has been done in the meantime is carried off to the mill and fed to the stamps; there may be sluices having hardwood riffles, leading from the mill to settling tanks, or it may be stamped dry, and

the work of cleansing left to the buddles, but the wet way is to be recommended as it will save a great deal of work in the buddles; the battery may be cleaned out every hour or a less period of time, according to the amount of ore that has accumulated in it, and carried to the round buddles to be selected. All the gold and silver will be left in the battery, except, perhaps, those fine shots which may be ejected by the stroke of the stamps, and which will be intercepted by the hardwood riffles; as for the tailings, they will be found to contain practically nothing.

Naturally you will have come to the conclusion that the arsenic and sulphur which were alloyed with the gold and silver, will still remain with them and be troublesome impurities, which can only be got rid of by refining, thus causing a further outlay of time and capital. This will depend principally on the temperature to which the ore has been exposed. If the temperature is only risen to that point at which the gold and silver melt, they certainly will contain these elements as an alloy, but if on the other hand, they are risen to that temperature which is obtainable in any roast pile, the gold and silver will be found free of even traces of these elements. In proof of this I shall make mention of an experiment by which I demonstrated it. I took ore known to contain both arsenic and sulphur and divided it into two portions, which we shall call A and B. I raised A in temperature until the gold was seen to form on the surface in globules and no higher. B I raised in temperature until it sintered. I afterwards made analysis of several of the globules from each portion; in A I found both arsenic and sulphur, and in further proof of my statement that arsenic and gold alloy, I found it (the arsenic) in the metallic state. I do believe that this could not have been confirmed more conclusively than by the finding of the metallic arsenic present. In the several globules from B, I found neither arsenic nor sulphur, thus shewing that the high temperature to which the ore had been exposed had oxidized them.

The oxidization is accomplished as follows: the extreme heat of the roast pile, when sintering, sets the sulphur and arsenic on fire, producing arsenical and sulphur fumes; the arsenical fumes combine with the oxygen of the air forming arsenious acid, $As.O_3$, of the old nomenclature, or arsenious anhydride of the new, $As_2.O_3$, and with the sulphur as sulphur dioxide, or sulphurous anhydride $S.O_2$, and also combine together to form the sulphides, the orange realgar $As.S_2$, and the yellow orpiment $As.S_3$. I found the former predominated. Also when the water is thrown on the ore it helps greatly the oxidization of these elements, and clears away almost all traces of them.

Now allow me to draw your attention to the advantages to be derived from this process. In the first place you must all be aware that the matrix of an ore, it matters not whether it be quartz, calc-spar or any other mineral, when heated to redness and either suddenly immersed in water, or water thrown over it, will be rendered quite brittle, and will fall to pieces with the least concussion or blow, and even with some the disintegration is so great that they will break up during their immersion or while the water is being thrown over them.

Now this would be a source of great and general economy, the stamping expenses would be reduced ; for instead of each stamp doing one ton per diem, they would do five tons ; five days' work would be done in one ; consequently saving five days' tear and wear of plant, also five days' steam and fuel, besides five days' wages to the workmen and other items of which I shall make no mention, unless to say that the returns would be quicker, thus making it a point of great importance.

I am of the opinion that many men of our profession are ignorant of the cause of the loss of a portion, if not all of the gold and silver in an ore, by assay, when treated by the amalgamation process, and which they call free gold, and which appears so to the eye, but in reality is covered with a thin film of sulphur which renders it impervious to the mercury to form an amalgam. It seems strange this has never been discovered before, but my father and I have proved it to be true, and were intending to publish a paper on it, but were anticipated by Mr. Skey, analytical chemist for the New Zealand Geological survey, who published a paper on this subject under the title of "The absorption of Sulphur by Gold and its effects in retarding amalgamation." Now, this sulphur can be got rid of by roasting at the proper temperature, and as to expenditure have I not shown the advantage in less labor and mechanical power being required in the further treatment of these ores ?

Another cause of great loss is the carrying away by water of the float gold. The cause of its floating is that, although it has the highest specific gravity or density of all the metals, except platinum, iridium, and osmium, which are 21·50, 21·15, and 21·4 respectively, gold being 19·50 and thus almost twenty times heavier than water, it has such a great surface in comparison to its weight that the water resists its sinking, and also the hydrodynamical force of the water in carrying it away even was it inclined to sink, keeps it in suspension and prevents it from doing so ; thus it is carried over the amalgamated riffle plates and lost. Now had the ore containing this fine gold been treated according to the process I have described, the fine and leaf gold would have been converted into globules, and even were the globules only the size of a pin's point

they are bound to sink as their surfaces are not to be compared with their density and the water cannot resist them ; they will all either remain in the battery or on the riffles as they are too heavy to be carried away hydrodynamically.

Then there is the great loss of mercury by neutralization by the arsenic and sulphur, which I before mentioned, and also those ores the matrix of which consists of calcium carbonate, cause enormous loss of mercury as it is absorbed by the mercury and causes it to be spongy and light, and to be carried away by the water more easily than even the fine gold itself. Now the amalgamation process can be dispensed with in this treatment, thus avoiding the above named loss.

As regards the presence of lead or any other of the baser metals in the ore to be treated, the lead would alloy and assist to collect the gold or silver ; as to zinc, antimony or others they would be completely oxidised.

In conclusion, I would lay special stress on the point that all ores should be selected, and not as is at present done, all rushed through as they come and by the same process, but arranged systematically and treated accordingly.

SOME POINTS IN THE NATURAL HISTORY OF GROUND WATERS.

By P. H. Bryce, M.A., M.D.

(Read 1st March 1890.)

To the President and Members of the Canadian Institute:

Gentlemen,—In choosing a title for my paper, while recognizing fully how much has been said and written regarding drinking water, I have felt that the enormous importance which attaches to it as one of the necessaries of life demands that public attention should repeatedly be drawn not only to the sources from whence pure and wholesome supplies are obtained, but also to the dangers which are associated with its pollution, and the ways by which this is brought about.

I propose in this paper to indicate briefly the physical characters of, and the phenomena associated with, ground waters, and thereafter to discuss some of the practical points which attach to their use for drinking purposes.

I.—THE SOURCE OF GROUND WATER.

We are aware that precipitation on land and sea of the moisture of the clouds is the method by which the water borne into the air by evaporation is returned to the earth. The yearly amount of rain which falls in Ontario is commonly more than 30 inches; but the amount of this that becomes ground water, that is sub-soil or subterranean water, is, owing to its rapid flow from the soil where it falls to the water-courses and to evaporation, probably somewhat less than half of the amount. That this amount which reaches the creeks and rivers is not wholly lost, but to some degree becomes a source of supply to subterranean waters, we shall, I trust, later on produce facts to show.

To refer to the ground waters of Ontario more particularly, let us recall the geological character of the strata in which these waters are found. The Laurentian band of gneissoid rock runs in a north-westerly direction, with its western edge in the neighborhood of Kingston, thence running to the south of Muskoka Lake, thereafter going to form with the Huronian series the islands of the Georgian Bay. Upon this, and

varying in extent and thickness, we have limestones, slates and sandstones, and limestones again succeeding each other until the Detroit River is reached. These have a general westerly dip or incline, varied, however by escarpments, anticlinals and synclinals, probably to a much greater extent than at present we have any idea of. Thus the Guelph limestone is about 900 feet above the sea, the Niagara escarpment reaching in some places nearly 1000 feet, while along the Detroit River and Lake Erie the rock level does not exceed, if it reaches, 600 feet, descending again from this at the level of Lake Ontario to but little more than 200 feet above the sea level. Overlying these rock surfaces of varying elevation, we have deposited in widely extended areas along the lower Lake Huron and Detroit River district, the whole of the Lake Erie shore, and a large portion of the Lake Ontario shore far east beyond Toronto, the boulder or Erie blue clay, overlaid in differing degrees of regularity and thickness by Saugeen clays, everywhere interspersed with layers of sands and gravels. On the higher levels, as of the Guelph plateau and the Oak Ridges, we have deposits of varying consistency from the tenacious argillaceous gravels of the central plateau, as at Guelph, to the arenaceous gravels of portions of the Oak Ridges and the stony and sandy soils of the lands dipping towards Georgian bay.

In addition, however, to these broad divergencies in the post-glacial deposits overlying the rock strata, we have the innumerable local differences, nowhere better marked than about Toronto, depending upon the denuding agencies which have hollowed out the whole Lake Ontario basin and produced the valleys of denudation such as the Humber and Don valleys, and the many smaller ravines distinctive in the sharp-cut outlines which deep erosion of these blue clays everywhere presents.

From this *resumé* it will at once appear that an endless variation in the conditions regulating the direction, depth and amount of the flow of ground-waters must exist, and we have two problems everywhere presenting themselves for investigation: the geological and the topographical. Let me give one or two illustrations.

The little river Avon, beginning on the high ground eastward from Stratford at a probable height of 900 feet or more, takes a general southwesterly course, flowing into the east branch of the Thames, which receives a similar stream at London, and passing westward through Chatham empties into Lake St. Clair some 575 feet above the sea. There are abundant outcrops of rocks along the Thames at St. Mary's and elsewhere in the vicinity, while at Chatham it is reached by borings at from 40 to 80 feet below the surface alluvium. Apart from the synclinal or depressed area, which practically forms the oil-boring region of

Ontario, there is the general incline of strata from the central plateau south-westerly. At Woodstock, at St. Mary's, at London, at Thamesville, at Chatham, and indeed all along the westerly part of this region, there is evidence of the enormous body of water flowing westerly from the higher ground to the east and north in the presence of artesian or flowing wells in greater or less degrees according to the accidental height of the soil as compared with the general level of the locality.

On the other hand, as an evidence of topographical influences, we have the fact that along the ridge of gravel which runs for many miles east and west along Lake Erie, at times touching the lake, at others being several miles away, and broad enough to have located upon it such towns as Ridgetown, Blenheim, etc., numerous springs may be seen issuing from either slope, in places only a hundred or so yards apart, those to the south flowing into the lake, the others tending towards the valley of the Thames some ten miles away.

To give but one other illustration, a gentleman who resided at Norway (near Toronto) for several years informed me that an old well had there been sunk in the sandy soil some fifteen feet and gave a fair supply of water. Its location being inconvenient to the house, he had another well sunk nearer, and within one hundred yards of the other well, and he had to go down some sixty feet in blue clay before what was probably the same bed of sand was reached : it yielded abundant water.

We have already referred to the source of subterranean waters as being due to the rain falling upon the soil, and to the fact that a large portion of the rainfall finds its way to the water-courses without being absorbed by the soil. The balance, however, probably amounting to about 50 per cent. of the total rainfall, is absorbed, but in very unequal amounts. The amount of absorption, as will readily be understood, will depend upon, first, the inclination of the surface soil, and second, on its pervious or absorbent character. Setting the first aside as unavoidable, we have to realize that the surface soil of Ontario with deforesting and cultivation, has lost in large measure the virgin mould made up of decaying vegetable matter which, loose in its character, absorbs in large degree all the rain which falls upon it. This not only gives the underlying soil every opportunity of absorbing all the moisture it can hold, but also maintains it in a friable condition very different from the hard-baked surface which any one may notice even in sandy soils, which are exposed to the heat of the sun. Accepting, however, existing conditions, it will be seen that notable differences exist between the absorptive powers of argillaceous and arenaceous soils and the various gradations between them. We must here note a distinction of much importance in its bear-

ing on this matter, viz., that between the capacity of a soil to hold water or its absorptive power, and its perviousness.

For instance, Prof. Schubler, of Tübingen, states as the result of experiment that—

Sand holds by attraction per	100 parts,	25 parts by	weight of water.
Loamy soil	"	40	"
Clay loam	"	30	"
Pure clay	"	75	"

Thus we see that perviousness is the opposite of capacity to hold moisture, as the most impervious soils have the greatest power to hold moisture within their interstices. The fact in drainage is a familiar one that where a clay has been puddled—for instance, where the heavily loaded waggon passes over a road—the clay particles become so closely pressed together that it becomes impervious until the moisture and the frost have disintegrated it again. Deep clay soils may similarly become through pressure in large degree impervious.

Now, we have already seen how, in different portions of the Province the superficial drift deposits lying upon the rock vary notably in character, and how the layers which succeed each other may alter in some instances within a few feet. These variations have depended, of course, upon the condition which existed at the time of their deposition. Remembering that from the melting glaciers and icebergs of the post-glacial era the detritus would follow the order which we can observe after a storm in any stream, we would expect to find what we do find, viz.: that the heavier boulders, gravels and sands would settle first along shores and in the shallow waters, and that the argillaceous materials, remaining longer in suspension, would last deposit in the outer and deeper waters. Currents, variations in the outlines of the shore, and all the other phenomena seen daily in lake or stream, must be looked to for an explanation of the local variations, to which we must add the denudation and innumerable rearrangements due to the floods of primeval mighty rivers, and the varying levels which have given us our system of lakes of varying levels.

This importance of the order of post-glacial materials has an interesting and very practical bearing upon the volume and direction of ground waters. To refer once more to the illustration given, we find the general character of the soils over Waterloo and Perth to be calcareous sands and gravels. Where these lie upon the rock we can see that there will be water-bearing strata of pervious layers, which may be continuous for many miles, and thus supply a *vis a tergo* pressure of enormous

power. This will, however, depend upon the character of the superjacent layers. If pervious, the water will on account of this pressure tend to rise to the surface. If, on the other hand, tenacious clays overlie these pervious layers, as is the case over a large portion of the Province, then these waters will rise to the surface only where denudations and erosions exist, as in the case of river valleys, causing springs, or where borings or dug-wells passing down through the pervious beds make a channel by which the tendency of the water to rise to the level of the head which it has can come into play. That this rise of waters in driven wells take place will depend, however, upon whether there is any hindrance to such underground streams following further in such pervious strata along the incline or dip which we have already supposed to exist in the underlying rock strata.

In other words, the occurrence of an artesian well depends upon the following conditions, as well expressed by Prof. Laveratt, who has examined largely into the question of public water supplies in the western prairie States:—(1) A pervious water-bearing stratum; (2) an impervious stratum below; (3) a second impervious stratum above the water-bearing stratum; (4) these strata must be inclined or have a dip; (5) there must be no adequate outlet for the water at a lower level than where the boring is made; (6) a sufficient collecting area or reservoir with superficial porous strata; (7) the collecting area must have sufficient elevation to act as a fountain-head; (8) there must be a continuity of the permeable bed; (9) there must be no flaw or break in either of the confining beds. Chamberlain has given the dip necessary as being one foot per mile. From these several conditions it becomes apparent that though one or several of them may be present, yet the conjunction of all of them is not by any means to be expected in all parts of the Province, although the numerous borings being made, especially in the western portion of the Province, for water, salt, oil or gas give evidence that such supplies of water are much more numerous than we at first might expect.

The details which we have just given are applicable in explaining the source, extent and progression of ground-waters on the broad scale. The most cursory examination, however, of the upper soils of many districts in the Province shows that the great proportion of ordinary well water is as yet got from comparatively shallow wells, there being present in most districts alternating local pervious and impervious strata, making wells yielding water possible within fifteen to fifty feet of the surface. In other parts, as in many portions of the western peninsula, shallow excavations through alluvium down to impervious clays becoming reservoirs

for surface waters, have till very recently supplied the great bulk of drinking water both in towns and country districts. Now in every instance the same laws are in force, and we have seen that they involve:—(1) A downward force of gravity; (2) a hindrance such as an impervious stratum; (3) a lateral movement of ground-water towards the lowest attainable point, whether this result in great subterranean water-beds on the rock strata, supplying conditions for artesian wells; whether in the appearance on the hill sides of gurgling springs and a saturated surface soil in the vicinity, or whether in the soakage into the nearest depression, as wells, cellars or other shallow excavations of waters, all following the general law of downward and lateral movement where obstructions do not prevent.

We have now reached the second and more important part of our subject, and the subject to which I have more especially devoted this study, viz., the constitution of ground-waters.

2.—CONSTITUTION OF GROUND-WATERS.

In addition to the chemical combination of hydrogen and oxygen making pure water, we are aware that a large number of other chemical compounds are held in solution by it, and that in its passage through the soil it dissolves out such soluble matter as it comes in contact with. We may hence speak of the chemical constituents of ground-waters as impurities, although, as we know, they owe to the mineral salts in solution their agreeable and wholesome qualities. These impurities, with minute amounts of organic matter, which from their occurrence independently of all adventitious influences may be called *obligatory* in contradistinction to the *facultative* or inconstant impurities which depend upon influences which may be removed I do not propose to refer to further here, but shall limit our study to the facultative impurities of an organic character.

Everyone is aware that water will carry in suspension, as in rivers, ponds, etc., very large amounts of organic materials, and that from these, whether animal or vegetable, it abstracts soluble matters, remaining present until decomposed into simpler constituents. To give but one illustration, the City of St. Louis, Mo., has four settling basins, holding 18,000,000 gallons of water. Their floors are paved with brick, and upon these are deposited by sedimentation the suspended, and to some extent the dissolved materials of the river water. Once in five months the sediment is flooded out of the reservoirs, and the quantity thus removed is nearly 200,000 yards, of course of largely inorganic matters. This is when the needs of the city allow only of sedimentation going on from

eight to eighteen hours, while clayey matters in suspension often take one week to subside. The sources of these impurities are those common to all river waters, viz., those due to vegetable matter from streams and rivulets rising and bearing with them the soluble matters from the bogs and virgin soils whence they spring, as also in certain localities the sewage deposits which may be poured in from towns along their banks. From such causes is due the fact that river waters are commonly considered unsafe sources of public water. They not only are readily contaminated, often to an extraordinary degree, but the swiftness of their currents often bears these impurities onward before the purifying influences have time to perform their work, and hence sedimentation and filtration beds have been brought into requisition in the endeavor to bring the water into a potable condition.

We see in these operations going on before our eyes in river waters an illustration of what goes on in the purification of ground-waters, only that the stages are in the latter instance more slowly and much more perfectly performed. The rain which falls on the surface is absorbed by the ground and bears with it minute amounts of carbonic acid and ammonia due to the combustion of the organic matters of the soil. These gaseous impurities of the air, which have had their origin in the ground, become of much value in aiding the disintegration of the soil and thereby promote the percolation of water through its layers. The rains receive, however, from the upper layers, which always contain organic matter either of vegetable or animal origin, soluble materials such as the above, soluble albumen, and other products of the humus, etc., and moreover what in addition to them has been borne to the earth, living organisms of various species, notably of the bacteria which, as is now well determined, are the agents of the decomposition of organic compounds, and these are in the soil in innumerable amounts. It has been already stated that carbonic acid and ammonia are the soluble compounds resulting from the decomposition of the organic matters of the soil. Now we find that wherever albumenoid matters, especially, are present in soils or in cultures which are artificially prepared, causing the multiplication therein of bacteria, these two gases are amongst the principal products. Subsequent chemical action as by oxygen, forms carbonates while nitrates develop out of the ammonia present. Manifestly, however, this extent of the oxidising process depends upon the depth of the organic materials in the soil, its porosity as regards movement in it of ground air and the depth to which the bacteria are found to have extended. Now while the first two conditions are interdependent and to some extent condition the depth at which bacteria are to be found, they show us that there are several other factors in the problem which must be considered.

Duclaux has stated that of the agencies which render water sterile, "the first, the oldest known and without doubt the most potent is the capillary action of the soil. Filtration practically retains in the capillary interstices the matters in suspension in the water, and with them the germs of microbes. It is a fact well demonstrated on which I shall only insist in order to attempt to indicate slightly what one calls capillary filtration . . . . It is only proper to remark at the outset that the capillary character of the channels in which circulates the water of rain, has only the effect of augmenting the extent or surface or the volume of water which leaves them, that is to say of multiplying the chances which a solid particle in suspension in water can have of encountering a portion of wall on which it fixes itself, drawn by a force analogous to that which fixes coloring matter in a tissue placed in a color solution. The effect would be the same if the chances of contact were found to be increased by any other cause. It could also happen and sometimes does happen, moreover, that a long repose causes to adhere to the walls of a vase the particles held in suspension in the liquid it contains. It can happen, and without doubt does happen, that a slow filtration through a great length of non-capillary spaces aids and even somewhat largely produces the same result as through capillary spaces shorter and narrower."

We thus see that the rate at which water passes downward through the soil which as Hofmann found at Leipsic in some virgin soil, was at the rate of 6·2 millimetres daily, or at 2·26 metres per annum, and which water, as Duclaux says, may remain six months or more as subterranean water before appearing on the surface as springs, gives ample time for sterilization. Exceptions to this sterilization of ground-water exist, as may be seen in calcareous soils, in which the action of carbonic on the chalk has caused by solution the formation of fissures often of great depth and extent, thereby allowing the carrying of contaminations to great distances. The conditions which regulate filtration in soils are, as Pettenkofer remarks, sufficiently constant for general laws to be made regarding them. He remarks that "the volume of the pores does not vary much in different soils, and may be considered to occupy one third of the whole. The dimensions of each pore may however vary considerably in different soils. In soils which contain large pores the water percolates rapidly; a compact soil in which the pores are very fine is essentially hygrometric or retentive. The level of a subterranean water may hence be uninfluenced by the heaviest rainfalls, if the water stratum be deep and separated from the surface by layers which may retain the heaviest rainfalls without allowing a drop to pass through. It is apparent, therefore, that with allowances for different kinds of soil, we have roughly different areas, or,

as Hofmann calls them, different zones, viz., the upper or evaporating zone, which may even hold the rainfall of a whole year, and becomes the receptacle of all kinds of organic impurities, the culture medium for germs of every sort. Hygienically, this is of all the most interesting and important. The second, or intermediary zone, always humid, reached at varying depths, may give passage to waters very slowly, and only gives passage to the surplus over saturation derived from the upper layers. While, generally speaking, this area is beyond the influence of surface operations, yet it will readily be seen that in the degree that the superficial layer becomes by the leaf mould of forests, drainage and cultivation, more pervious, the greater the amount of water that is absorbed, and the more readily will the underlying zones be influenced from it. Drainage and the cultivation of grasses, now that the forest areas have disappeared, are essential to the conservation of the level of ground-waters, since through their agency perviousness of soil is maintained, and the retention of pluvial waters where they fall is made possible.

The third zone in compact soil is only a few inches thick, increasing in depth where upper soils are more pervious. This is the supersaturated layer along and through which flows the underground stream. The depth of this stream or the thickness of this zone is slowly or rapidly influenced according to the compact or porous character of the upper soils, the extent of the watershed above any given point, and the inclination or dip of the more or less impervious stratum or hard-pan along which this underground stream flows. An illustration as in the instance of the London West flood in 1883 demonstrates this, while on the other hand the greater hygroscopy and retentiveness of clays with their closer texture, as already shown, will prevent surface influences readily showing themselves.

The remaining cause influencing these subterranean streams is that already referred to as existing here and there in those instances where the surface stream, as some river or lake, has waters at the same level as the subterranean waters. The rise and fall of these surface waters caused by heavy downfalls of rain, and by winds raising or lowering the level at different parts along our lakes (*e.g.*, at Owen Sound, Goderich, Lake St. Clair, Moulton Township), shows how the ordinary conditions governing these underground streams may have local extraordinary influences contravening the general law.

Returning to the consideration of the conditions which govern the existence and multiplication of microbes in the soil, we have to recollect the inconceivable richness of the superficial layers of organic matters in microbes. Two millions to a centigramme of soil, as Duclaux gives it, but

imperfectly conveys any idea of their number. Take the instance where in heavy clay soil the autumn and spring rains have saturated it almost to the surface. Here the small amount of air in the upper soil prevents oxidation in large measure of the organic matters. The lack of oxygen impeding the multiplication of bacteria is notably aided by the low temperature of this soil induced by evaporation. Parkes indeed found a difference of 12 ° F. in the temperature of the upper layers of two contiguous pieces of bog land, one of which was drained while the other was not. Now, however, when the ground-water falls, the air follows, and with moisture and warmth nitrification goes on. But this favorable condition may be temporary. The heat of summer rapidly bakes such surfaces, air does not penetrate the deeper layers, and the moisture being deficient the multiplication of bacteria is again limited. Clearly, however, the recession of ground-waters from the surface with increasing temperature, as after the spring rains, means an increase in depth of the area to which nitrification extends—or in other words the depth at which bacterial infection of the soil is present. In fairly pervious soils the roots of species of the clover and pea family have been found ten feet below the surface, while the roots of trees following the area of perviousness and nitrification, run laterally, and spreading out obstruct tile drains, and reach into wells at a depth of twenty feet or more. Duclaux remarks, the extension of germs downward in the soil ought theoretically to take place by a general extension, by increase from point to point, by gradual growth, causing invasion of the deeper layers, and in carrying life into regions which as we know remain sterile. He then asks, Why this sterility? Fraenkel has pointed out that the temperature at two or three metres below the surface is an absolute obstacle to the multiplication of the bacilli of typhoid and cholera, yet inasmuch as microbes may through cultivation acquire an ability to grow at lower temperatures than those normal for them, Duclaux affirms that the low temperature is not sufficient to explain the phenomenon. Further, the absence of nourishment cannot be given as a sufficient explanation, since microbes can live and even multiply in distilled water, living, as Pasteur says, on their own tissues. A most potent cause exists, however, in the absence of oxygen, which is more rare the deeper we go into the soil. Instead of oxygen, we find in such layers carbonic acid relatively in excess, and Léone of Munich, of Pettenkofer's laboratory, has by experiment found that Munich waters, which at the place of origin contained 115 microbes per centimetre contained 10,500 in 48 hours, and 500,000 after five days. At the end, however, of another five days, he found that in this water, in which the carbonic acid due to decomposition had so greatly increased, the number or microbes had fallen off to 87 per cent. centimetre. That

this gas has a specific influence in preventing the increase of microbes was proven from the fact that if replaced by a current of hydrogen there occurred a rapid increase in the number of microbes.

Whether or not, however, anaerobies or microbes which multiply in the absence of oxygen, can multiply in these deeper layers, experiment is as yet lacking to determine. Certain it is that these waters flowing in the tertiary zone or stratum of supersaturation with a slow uniform movement depending upon their depth, the weight of water and dip of the underlying impervious bed, end by arriving at the surface as springs, or in wells (either dug or driven) in a sterile condition. Arrived here, the water comes in contact with air, sometimes with light, also with infected soils as of the mould of the surface or the organic matter which finds its way into wells, and, the conditions of sterility having disappeared, it becomes again inoculated with microbes.

As may be readily understood, the farther from such underground conditions a water proceeds the greater are the possibilities of its inoculation and of the variety as well as the number of the microbes in it. As natural waters in different regions vary in temperature and in the amount and character of the organic and mineral constituents in them, it is very natural that different species of these microscopic plants should be characteristic of different waters. Winogradsky has studied the species of sulphur water, while Fazio and others have found species peculiar to the waters of Naples, Castellamare, etc.

How extended are these differences of species and what the peculiar influences favorable to each, has not yet been investigated. Indeed it may be said that this study of species is little more than begun. When classification has become possible, the still more difficult matter of deciding which are pathogenic and which are innocuous will yet remain.

Work with a view to determining under what circumstances these sterile underground waters can be obtained pure for drinking purposes has recently been carried on by Carl Fraenkel of Berlin, and some interesting results have been obtained. I shall take the liberty of introducing here a condensed abstract of his experiments, as they are found to be wholly in accord with the views, which reasoning, based upon the physical characters of underground waters in relation to geological conditions and to the known facts regarding bacterial life, has led us to deduce.

Fraenkel's investigations were undertaken to determine if it were possible at all to remove with complete success infective material which had once gotten into a well.

He notes the two forms of wells, so called kettle wells (kesselbrunnen) from which the water is obtained by bucket or pump, and the artesian wells (rohrenbrunnen). These two forms are exposed to different methods of infection.

The kettle wells are exposed first to infection from above; secondly they never possess walls of such a character as to exclude infection from the surrounding soil. Experienced well-diggers assure us that no kettle well, even those with the best cement or asphalt walls can be depended upon to remain absolutely tight. They constantly act in relation to the surrounding soil as powerful drains which not only receive the ground water, but also the surface water. They are protected of course to a certain extent from surface infection by the filtrating power of the soil. Superficial layers, however, are much more loosened up (artificially and naturally) than lower layers, consequently the power of filtration is not so great.

Tube or artesian wells are not exposed to such danger of infection from upper openings as kettle wells. From the outside, from the nature of their construction, they are completely free from dangers of infection.

Both kinds of wells may be infected, if such infection exists, from the ground water.

He reviews the subject of the germ contents of ground water, considers the results as unsatisfactory and consequently in this paper takes up the question anew.

The artesian wells, which were used for the experiments, were two in number, situated in the court of the Berlin Hygienic Institute, in a part of the city which has been inhabited for a number of centuries, and within a few hundred metres of the Spree. Both had been placed in position about two years and a half previously, and had been little used. At the time of investigation the wells had not been touched for several months; the ground water stood at 4·48mm, average day temp. 12 ° C.

Water first removed contained in 1 ccm. 10,800 germs. This large number is explained by the stagnant condition of the water.

		Amount pumped.	Number of microbes.		
April 10th, 1888.	Litre	2	7,200	per	ccm.
	"	50	560	"	"
	"	100	154	"	"
	"	200	120	"	"
	"	500	54	"	"

Next day—

		Amount pumped.	Number of microbes.
April 11th, 1888.	Litre	1	7,000 per ccm.
	"	50	140 " "
	"	100	160 " "
	"	200	84 " "
	"	500	42 " "

April 12th, third day, practically the same result even when double the amount of water was taken out; results about the same.

April 13th.	Litre	1	Plate fluidified.
	"	50	130
	"	100	150
	"	200	42
	"	500	20
	"	1000	18

It was apparent from the sudden fall from litre 1 to litre 50 in number of germs that the number in the first litre were due to development in the well itself. This is shown by tables in which every litre up to the first ten was examined.

April 16th, 1888.	Litre	1	6,400
	"	2	5,000
	"	3	4,200
	"	4	1,400
	"	5	800
	"	6	800
	"	7	450
	"	8	380
	"	9	360
	"	10	320
	"	500	360

The same day, six hours later, the well was again examined, and gave—

Litre	1	6,800
"	5	3,800
"	10	620
"	100	80

It is evident that an extremely energetic washing was necessary to remove the masses of bacteria in a purely mechanical way (amount of water actually in well calculated at 5 litres, depth of well 8 metres).

The continued appearance of bacteria after the removal of so much water may be explained by the continual entrance of fresh germs in the incoming ground water at the bottom of the well. But it may also be due to the formation of a zooglea membrane by the bacteria which stick to side of tube and small portions of which being given off to water which passes through would give rise to the constant appearance of germs. It was necessary then to determine the character of the ground water by thoroughly disinfecting the tube.

On April 27th, water showed the following—

Litre	1	11,200
"	100	110
"	500	22

On the 28th the pump was taken out and placed for two hours in a two per cent. watery carbolic acid solution ; the tube itself was thoroughly washed by means of the long handled brush, and finally five litres of 5 per cent solution of Laplace's mixture of raw carbolic acid and sulphuric acid (equal parts of each) was poured into the tube. It quickly sank into the well until finally the water stood at its original height.

Next day the well was pumped out and the water examined. After 100 litres no trace of carbolic acid, either by odor or by ferric chloride reaction ; also at 500 litres. Gelatine plates from the water remained sterile. Well remained sterile for seven days after disinfection. There was the possibility that carbolic acid still remained in ground water and so destroyed organisms there present. It was not likely as it must be present in such small quantities as not to affect development. Direct experiment showed that sterile water if artificially infected had no injurious affect on organisms ; this sterility of the water was due to the disappearance of organisms from tube.

After seven days the well was left for one day without pumping. Next day germs had reappeared. Evidently due to infection from above. Water having been left in undisturbed condition it had had time to develop and form zoogloea stages.

A second experiment was disinfection with 4 per cent. sulphuric and carbolic acid mixture. Tube was not mechanically cleaned. The results were that same remained germ free for six days. Then there was a gradual reappearance.

Third experiment, less carbolic acid mixture taken, but concentrated (2 litres). Taste of acid noticeable for several days after, but gave no reaction with ferric chloride. Remained sterile four days, but not till the twelfth day did germs appear in litres 500.

Further experiments undertaken with artesian wells gave results completely in accord with above.

Fraenkel notes here that the sterility of water might be due to the fact that carbolic acid had sterilized a layer of soil at base of tube, which for several days filtered away the organisms in ground water, but that finally they penetrated this layer and then appeared in well. To overcome this objection he caused the well, some days after the complete re-establishment of the germs in it, to be thoroughly cleaned out by scrubbing it for half an hour with a long-handled brush. Then water examined gave the following result.—

Litre	1	Innumerable
"	100	780
"	500	Sterile,

and the well remained sterile for the four following days.

It was evident that germs originated from the sides of tube itself, and not from ground water. Mechanical cleaning was sufficient to remove them.

He concludes therefore that except in certain cases (dependent upon soil) the ground water may be looked upon as germ free. Conditions which might lead to an infection of ground water, are character of soil above the water, layer rather loose in character; water layer too close to upper surface of ground, occurrence of drains in water layer which were not perfectly tight, or finally, the presence of muddy wells.

He finally studied the effects of the disinfection of artesian wells upon spores of bacteria. He could not use anthrax spores from their dangerous nature, but used almost equally resistant hay bacillus spores, and spores of blue milk bacillus, as well as the micrococcus prodigiosus.

Results were all favorable; sterilization was easy. He tried the disinfectant characters of lime, but found there was not sufficient amount of water in artesian well to dissolve it, and danger of spoiling well by the formation of a sort of mortar which could not be easily removed.

He next started a series of experiments on two kettle wells, also situated in the court of the Hygienic Institute, and each containing about 1·3 cubic metres of water.

KETTLE WELL I. May 10th, water showed as follows :—

Litre	1	320
"	100	130
"	500	70

May 11th. Two litres containing sulphuric and carbolic acid poured into the pump and left till following day. Then first water showed strong carbolic reaction, and it could be noticed in water for about a week, gradually becoming less intense.

May 12th. Water apparently sterile.

May 13th. Litre 500, 17 colonies.

May 14th. All three (1-100-500 litres) contained colonies, and an increase in number was noticed from that time in spite of the still considerable amount of carbolic acid in water.

May 19th. 10 litres—carbolic mixture poured in, pump tube brushed out and water in well thoroughly mixed up. Results were even more unsatisfactory.

May 20th. Germs were in water in spite of intense odor of carbolic acid water of a brownish yellow color, and ferric chloride test gave a very marked reaction.

May 21st. Germs had increased to an extraordinary number in spite of presence of considerable carbolic acid. Explains want of success in above experiment as follows.

In kettle wells, where there is always a considerable amount of water present, a sedimentation takes place in the stagnating contents, and the formation of a thick layer of mud on the bottom. In addition, there is the formation of a much larger amount of the zooglea layer on the wall than in the artesian wells. There is a very much larger number of bacteria in the second experiment than in the first, explained by the fact that before the first experiment the well had stood untouched for a long time, consequently the water had, as it were, been exhausted of all its food material by the bacteria which were in it, and they had all been converted into spore form, and had sunk to the bottom, forming a thick layer in mud.

The pumping out of the water had allowed fresh water to stream in, and the stirring in connection with the experiment had disturbed the material at bottom of the well.

The carbolic acid had destroyed the germs in the water itself, but had not reached those in the mud at the bottom of the well.

This also explains the first appearance of organisms in the 500 litre sample, i.e. in lower layers of water.

Another experiment on the same well contained a large amount of sulphuric carbolic acid mixture (10 litres conc.) with as thorough as possible disturbance of the mud layer. The result was not much better, water sterile for two days, then reappearance of germs with continued presence of carbolic acid.

The next experiment was on kettle well 2, which was not walled over, but simply closed by a stone which could be lifted.

May 16.	Litre	1	6,400
	"	100	920
	"	500	180

May 17th. Stone cover lifted; mud at bottom 7·83 cm. thick. By means of a stick with heavy T piece at end, the mud was mixed up with water as thoroughly as possible. Then 10 litres conc. sulphuric carbolic acid was poured in, and the contents of well further stirred up, and the water pumped.

May 18.	Germ free.
May 19.	" "
May 20.	" "
May 21.	Germs appeared first in litre 500.

He concludes that well was not thoroughly sterilized.

A second experiment gave similar results, but somewhat sooner reappearance of germs, possibly due to sudden rise in temperature.

It is evident that sterilization in above manner is not practicable, especially as the long continued presence of the carbolic acid in the water prevents its use.

He therefore endeavored to find the value of lime as a disinfectant for wells, because, 1st, its presence in water does not prevent its use. 2nd. It has shown itself especially useful in cases where it was a question of the removal of suspended organic matter.

June 9th. 10 kgrm lime was shaken up with 4 kgrm water, and the whole poured into well 2. Then the well contents were thoroughly mixed mechanically, and finally the water raised to the top of pump in order to disinfect it also.

June 10th. Sample intensely alkaline. Water for the four following days contained a considerable amount of lime in solution.

But three days after disinfection germs appeared in litre 500, and the moment the free lime disappeared from the water.

June 14th, a tremendous increase in germs was noticed.

Results, therefore, were unsatisfactory.

A second experiment with 25 kgrms of lime gave same results.

Experiments similar to those on artesian wells with spores of hay bacillus and blue milk bacillus, and culture of micrococcus prodigiosus, showed that 20 kgrms lime was capable of removing them from water.

It is evident from above experiments that a complete disinfection of kettle wells is impossible by means used, but that for the destruction of germs which might possibly get in from above, immediate use of considerable quantity of lime be recommended.

He concludes that the evidence against the kettle wells is very strong, agrees with Pflugge (Zeit. für Hygenie Bd. II. s. 406) in calling them "hygienic monsters."

He strongly recommends their replacement in all cases by tube wells.

These experiments are to me intensely interesting, published as they were at a time when I had undertaken to determine, with such time and ability as were at my disposal, the bacterial relationships of waters existing under a number of different conditions.

On the 5th of July last the works were opened at the London Asylum in connection with the sewage farm intended to dispose of the sewage from that Institution. Under the superintendence of the public works department, the plans prepared by Colonel Waring were completed. The sewage was to be pumped daily to the farm by Webber's centrifugal pump, which finely divided the solids it contained. At the farm the sewage was turned into a number of open ditches 2 feet deep by 6 at top and 2½ at the bottom. Alternating with these were flat beds 12 feet wide graded to a level surface. Under each alternate bed was a field tile drain 4 feet deep, increasing to 6 at the further end of the field, where they join a common effluent tile, this leading to an open ditch known farther down as Carling's creek. This flat bed is composed of a very sandy soil some five acres in extent, and is supplemented by a field of some ten acres graded for surface irrigation. One-third of the ditches were flooded each day, but the extremely dry weather prevented even a portion of the field from becoming saturated during July and August, and so prevented the attainment of one object of the experiment, viz., the comparison of the biological character of the water running from the effluent tile as compared with the several

other waters which were examined. The water samples were taken under the supervision of Dr. N. H. Beemer of the medical staff of the asylum in sterilized and capped tubes sent to him from week to week. The examinations made the succeeding day, while not giving the exact number of the microbes in the water at the time of taking, would yet give the comparative results of the different species and the results of the different week's examination of the few drops of water taken from any water, this being all that is needed for an examination. I may say that the successive samples of different waters showed surprising constancy of forms, both as regards species and number. For instance :—

No. 1. Tile drain, 14 forms—10 liquefying, 4 non-liquefying.

No. 2. Effluent from sewage farm, 6 liquefying, 3 non-liquefying.

One week only.

No. 3. East creek. All portions of culture showing innumerable slowly liquefying spots, all the same form apparently; probably M. candicans.

No. 4. Carling's Creek. All portions of the gelatine show innumerable liquefying points with whitish granular particles in the larger liquefactions.

Nos. 5, 6, 7 were practically sterile, showing as they did only one or two forms which were not moulds—possibly got from the air of the tank rooms. I shall say nothing more regarding their species, except that they were few in number, some seven in all in the whole series of cultures. The notable fact gained was, however the innumerable bacteria present in the open water of creeks. Samples taken again and again from both Carling's creek and East creek always produced one form in great abundance —probably M. candicans—in the latter in greater abundance as the water with the drought became less and more impure. It was always with much satisfaction that our inoculations of London city water indicated practical sterility, taken as it is from springs appearing at some height above the river bank below the city and gathered in a small collecting gallery. The samples were taken from a city tap. The same sterility was found in the water coming from a faucet in the pump-house at the asylum, the water coming from a bored well of considerable depth. The water from the tank at the top of the building showed occasionally a mould or two as would be expected from a tank in a confined space at the top of the house. No less interesting is the fact that the water arriving at the mouth of the tile yielding sub-surface drainage from a field was practically free from bacteria. The effluent water from the tile drain leading from the sewage farm, the one week that a sample could be obtained, showed as great freedom from contamination as did the other tile water.

Of course there had been no time for polluting the soil and this was probably common sub-surface water. It shows however that the field, some five acres in extent, was capable of absorbing more than 100,000 gallons daily without supersaturation in dry weather. A letter received to-day from Dr. Beemer says so far the farm, during this whole winter, shows no surface collection of a notable character, although the soil as we know has everywhere been in a condition of almost complete and constant saturation.

Now, without making any positive statements, I think that as regards this whole matter of natural waters we may fairly draw the following general conclusions :—

1. That while the atmosphere as compared with the soil is relatively free from bacterial life, yet rain-water bears to earth from the air and gathers from the roofs, etc., the elements of auto-contamination, and finds in the organic matters gathered from roofs, etc., abundant nutriment for them.

2. That falling on the surface of the ground waters become loaded with bacteria of the soil, whether those indigenous to it or which have been borne to it from a distance.

3. That of these contaminated waters about 50 per cent. are not absorbed but follow the surface inequalities into brooks and thence into the larger streams and great lakes. The brook as it passes through virgin soil collects much albuminoid matter which affords abundant nutriment for microbes, borne into it from every side, and when the stream reaches a part where barnyards, and other sources of sewage pollute it, it is likely—nay, certainly will—become contaminated with bacteria of a dangerous character.

4. Where gathered into the great lakes, deep and hence very cold, with constant aeration going on and constant exposure to sunlight of their great areas, there follows a great diminution in the bacteria of the water through a lessening of the organic nutriment for microbes, and hence a great halt in their multiplication, owing to the low temperature, aeration and exposure to sunlight.

5. Rivers, shallow lakes and bays along the great lakes, and these especially during those periods when, by evaporation, their volume is so greatly diminished by evaporation, are likely to become very impure and the causes of their impurities are likely to remain more or less permanent.

6. The fifty per cent. of rain water which is absorbed by the soil has a different history. Loaded with impurities in the upper layers of

the soil, it passes slowly by percolation downward and loses gradually through capillary attraction, lessened nutriment, decreased amounts of oxygen and increased amounts of carbonic acid, its previous bacterial pollution, and with few exceptions appears in springs and subterranean waters, where tapped either by tube or the common pit wells, as absolutely sterile or wholly devoid of bacterial life.

7. That in the tube wells, with careful driving of the iron tube to prevent soakage along the outside, and a brief pumping to carry off the contaminating bacteria which reach the inside through aerial contamination, we can obtain a practically sterile water of first quality for drinking purposes.

8. Through organic soakage in the upper and most readily accessible direction for the lateral movement of subsoil waters, such waters carry abundant nutriment for bacteria, which are carried in the same manner and by the filthy washings of the top and from the air which occupies the pit, with little aeration and the absence of sunlight and a temperature in shallow wells affected by external temperatures, conditions most favorable for the development of bacteria exist. Hence these wells under ordinary circumstances, but especially where found in back yards, under kitchens, in barnyards or as shallow dug outs in the black soils of the west and all newly-settled countries, are veritable pest-holes, more dangerous to the health than probably all other local sources combined in those seasons when low temperatures do not prevent bacterial development. They are really what Pflugge calls them, "hygienic monsters."

I conclude this paper on a subject which is exhaustless, in the words of Duclaux, "One suspects more a water which receives a minimum quantity of excrementitious matters than a water which might be charged with germs after the water had run over a desert region. This question of the nature of germs is too important for us to dream of limiting it by the length of this review already too long, in which we have wished to study the question of quantity. But in waiting that one may find the means of indicating in a water the hurtful or pathogenic germs which it contains, and having found in this way a measure of the degree of their nocuousness, we confess that the only waters to be recommended are those which contain no germs at all."

THE DÉNÉ LANGUAGES.

Considered in Themselves and Incidentally in their Relations to Non-American Idioms.

BY THE REV. FATHER A. G. MORICE, O.M.I.

(Read 19th April, 1890.)

INTRODUCTION.

Among the allied sciences which concur in lending ancillary aid to Ethnology none can be compared to Philology. Anthropology's services are valuable, it is true ; yet its investigations tend to the solution more of racial than of ethnic problems. Archæology can hardly be regarded as an infallible criterion of ethnological certitude, since we find among peoples confessedly heterogeneous implements and sometimes monuments of striking similarity. Mythology or Dæmonology can still less aspire to the first place in the ethnologist's esteem ; for, not to speak of the universality of certain myths or beliefs, a people's legends and its very theogomy itself are liable to yield to the latent pressure exercised by foreign nations through migrations, captivity or commiscegenation. Sociology can lay claim to great importance indeed ; still it cannot be assigned the first rank among Ethnology's satellites, since we find among such ethnically different peoples as the Jews and the Caffirs, observances the identity of which would lead to false conclusions were Sociology allowed supreme importance in the decision of ethnological questions.*

Such is not the case with philology. "Nothing is more characteristic of the intellectual existence of man than language," says Gallatin.† "It is found to be a more enduring monument of ancient affinities than the physical type, and there is no tribe, however situated, from which this proof of affiliation should not be obtained." This opinion is corroborated by a contemporaneous author, Horatio Hale, in a paper read some years

*The most striking instance adducible in confirmation of these and the following remarks is that of the Nabajoes of New Mexico and Arizona. Those aborigines who are geographically surrounded by heterogeneous tribes, and inhabit a country some 1,500 miles south of the most southern Dénés' hunting grounds differ in physical type, natural dispositions, manners and customs from our Indians. Their legends, myths and religious observances have no equivalents here, and yet their speech stamps them at once as an offshoot of the great Déné family.

†Am. Ant. Coll., Vol. II.

ago before the American Association for the Advancement of Science, the fundamental proposition of which is that "the only satisfactory evidence of affiliation or direct relationship of two communities, apart from authentic historical records, is their speech."*

Well might that multifariously-gifted philosopher Leibnitz deplore the carelessness of the explorers of his time, who did not think it worth their while to collect vocabularies of the languages spoken by the nations they pretended to make known to the civilized world. "C'est un grand défaut," he says, "que ceux qui font des descriptions de pays et des relations de voyages oublient d'ajouter des essais des langues des peuples, of car cela servirait pour en faire connaitre les origines."† This reproach the German philosopher, though addressed to travellers in foreign lands, might be construed as applying with even a greater degree of force to those who, like the missionaries, are by the nature itself of their avocation bound to reside among the natives of the countries they evangelize. Not to deserve it, I, for one, shall attempt to unfold to the appreciation of the indulgent philologist the beauties of the languages spoken by a family of American aborigines who, if low in the social scale, still possess in their native dialects vehicles for thought more expressive, and, in their own way, richer than that of many civilized nations. I mean the languages of the Déné Indians, of whom I have given a sociological outline in a late fasciculus of the "Proceedings" of the Canadian Institute.‡

For the benefit of those who may not have read it, let me state that by Dénés I mean that large family of Indians more commonly known under the inappropriate§ names of Tinné, Tinneh, or Athabaskan. It extends west of the Rockies from the 51° latitude north and east of that range of mountains from the Southern Branch of the Saskatchewan to the territory of the Esquimaux. Apart from the Nabajoes of New Mexico, who are ethnologically connected therewith, it is divided into a dozen or more tribes speaking as many dialects.

For the sake of briefness, all the aboriginal terms unavoidably used in the course of this monograph shall be, unless otherwise noted, in the dialect of the Carriers, the most important of the Western tribes. I shall also, to facilitate the intelligence of some of my remarks, occasionally point out the relations of these idioms to the principal other linguistic groups, especially the classical tongues.

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*Am. Antiquarian, IV., Nos. 1 and 2.

†Leibnitz, *Monumenta varia inedita, ex Musæo J Feller*, tom. IX., p. 595, Jena 1717.

‡Proceedings of the Canadian Institute, Octob. 1889, p. 109 and seq.

§See "The Western Dénés"; Proc. Can. Inst. Oct. 1889, p. 109, note 2.

CHAPTER I.

PHONETICS AND GRAPHIC SIGNS.

And first a word concerning the Déné Alphabet. To be complete, it should count—apart from reduplicated but phonetically unchanged letters—no less than 60 graphic signs, 13 of which to represent vowels, 39 for simple and 8 for double consonants.

The vowels are a, â, æ, e, é, è, i, î, o, ô, u, û, ü. They are all pronounced as in French except *æ* which corresponds to the French *e* in *je, te, le ; é* which is sounded as the *e* in the French word "*mets*"; *è* as that of the English "ten"; *e* and *u* which have the Italian and *ü* the German sound. The use of the latter is confined to a few insignificant bands of Aborigines who have made the Rocky Mountains their home.

The 29 simple consonants are *b, d, f, g, j, k,* χ, *ḳ, l, ɮ, m, n, ñ,* N, *p, q, q̣, r,* ʌ, R, *s, ṣ, t, ṭ, v, w, y, z.* They are all sounded as in English with the exception of the following: *h* is strongly aspirated ; *j* is pronounced as in French ; *ñ* as in Spanish* ; N is nasal ; *ɮ* is a lingualo-sibilant which is obtained by the emission of a hissing sound on both sides of the tongue curved upwards previous to its striking the lingual letter ; *r* is the result of uvular vibrations ; χ and ʌ are respectively *k* and *r* pronounced with a very guttural inflection ; R is the common *r* of the Romance languages, and is proper to a handful of Rocky Mountain Dénés ; *q̣* corresponds to the hard *c* in the words "*cœur, curé*" such as pronounced by North-western Frenchmen : it can be described as approaching the sound of *ty* both letters being consonants and sounded simultaneously. The dot in *ḳ, ṭ, q̣,* adds to the regular pronunciation of those letters the exploding sound peculiar to most Indian languages. *ṣ* is phonetically intermediate between *s* and *sh.* The *f* and its co-relative *v* are found only in the speech of a few Eastern tribes.

By double consonants I do not mean the mere succession or grouping of two or more of the above letters retaining their original value as *tl, kw, kfw.* I have in mind those consonants which, either are differently pronounced when agglomerated, as *ch,* or represent sounds which, though phonetically one, cannot be expressed by any of our consonants taken separately. There are eight such double consonants : *sh, ch, th, kh, kr, ḳr, ṭs* and *ṭl.* The first two are pronounced as in English ; *th* and *kh* are equivalent to *t*+*h* and *k*+*h* but are produced by a single emission of voice.

* It is proper to a few Northern Dénés.

Such is the case with *kr* and *kṛ*, save that the sound of the *r* in this phonetic compound is perceptible only for the natives and those who may have made a specialty of the study of their language. *Tṣ* and *tḷ* have the exploding sound and their value can hardly be taught otherwise than *viva voce.*

To the foregoing should be added the hiatus (·) which has the effect of abruptly interrupting the pronunciation and slightly elevating the tone of the syllable it follows.

There is no accent in Déné.

Besides, the Déné dialects possess two genuine diphthongs : *au* and *ai* pronounced respectively as the German *au* and the English long *i* in such words as " fire, mire," etc. A peculiarity of the language is that it avoids the succession of two vocalic sounds with as much care as the Polynesian idioms do the accumulation of consonants. Thus " Leo " is pronounced " Leyo " and " Noah, Nowah " by our Indians.

Among the consonants *b* and *p*, *d* and *t*, *k* and *g* are respectively undifferentiated through the whole Déné linguistic group. They can be interchanged without in the least affecting the sense of the word, whilst *ṭ* and *q*, *p* and *v*, *ts* and *kw* or *kfw*, *tṣ* and *kw* are co-affin and transmutable from dialect to dialect and particularize the tribe to which the orator belongs. The same remark applies, but in a broader sense, to the vowels, all of which admit of the possibility of being transmuted with another, no matter how great its phonetical dissimilarity. This last peculiarity will no doubt strike the comparative philologist as an important point of resemblance between the Déné and the Semitic languages. Non-transmutable consonants characterize the idiom and lexically differentiate it from other mother tongues or linguistic families, while the vowels specify the dialect and change from tribe to tribe. A few examples will illustrate my meaning :—

MAN is *kiat* in Kitikson or Abna (Skeena River idiom) and *tœne* in Carrier, the language of the Kitiksons' eastern neighbours. BEAVER is rendered by *tṣœmillih* ; CANOE by *mœl* ; RAIN by *wish* in Kitikson, while the Carriers use the words *tsa*, *tṣi*, and *chan* respectively to express the same ideas. These terms being roots in both languages, the dissimilitude of their main constituent part, the consonants, suffices to immediately arouse in the mind of the philologist a suspicion of diversity of language, which a prolonged investigation does not fail to confirm.

Let us now examine the same root words in the various Déné dialects.

MAN is *tœne* in Carrier, *tœni* in Chiſχohtin. *tènè* in Sékanais; *tana* in Nabajo, and *déné*, *danè*, *denu*, *dine*, *dune* in other eastern dialects.

BEAVER is called *tsa*, *tse*, *tsi* and *tso*, according to the dialect.

CANOE is rendered by *ṭsi*, *ṭse* and *ṭsu*, relatively to the different tribes.

RAIN is translated *chan*, *chon* and *chièn* in Carrier, Hare and Loucheux respectively.

Here the similarity of the consonants through the various dialects at once strikes us as suggestive of philological affinity. Furthermore, a searching analysis of the elements which concur in the formation of the root will reveal the fact that the real radical for "man" in Déné, considered as a distinct linguistic stock, is *t-n-* or its equivalent *d-n-*, while that for "beaver" is *ts-*, that for "canoe," *ṭs-*, and that for "rain" *ch-n*, the hyphen replacing the vowels, which as we see, have but secondary importance.

As another instance of the preponderating role played by the consonant, let us take for examination the Loucheux word *Tan*. A linguist unmindful of the foregoing might, rather than compare it with the Carrier word *TœNnge*, assign to it the same signification as the quasi-homonymous Chiſχohtin *Than*. Now it happens that *Tan* means "four," while *Than* means "three," the *T* simple running through all the dialects as the chief formative element of the Déné terms for "four," (*tœNnge*, *tîngi*, *tînyi*, *tankre*, *tan*, *tî*), whilst the *Th* performs the same function, with the help of variable vowels and non-initial consonants, with regard to the different words used to express our English "three," (*tha*, *than*, *thake*, *thaqe*, *thaye*, *thîèg*.

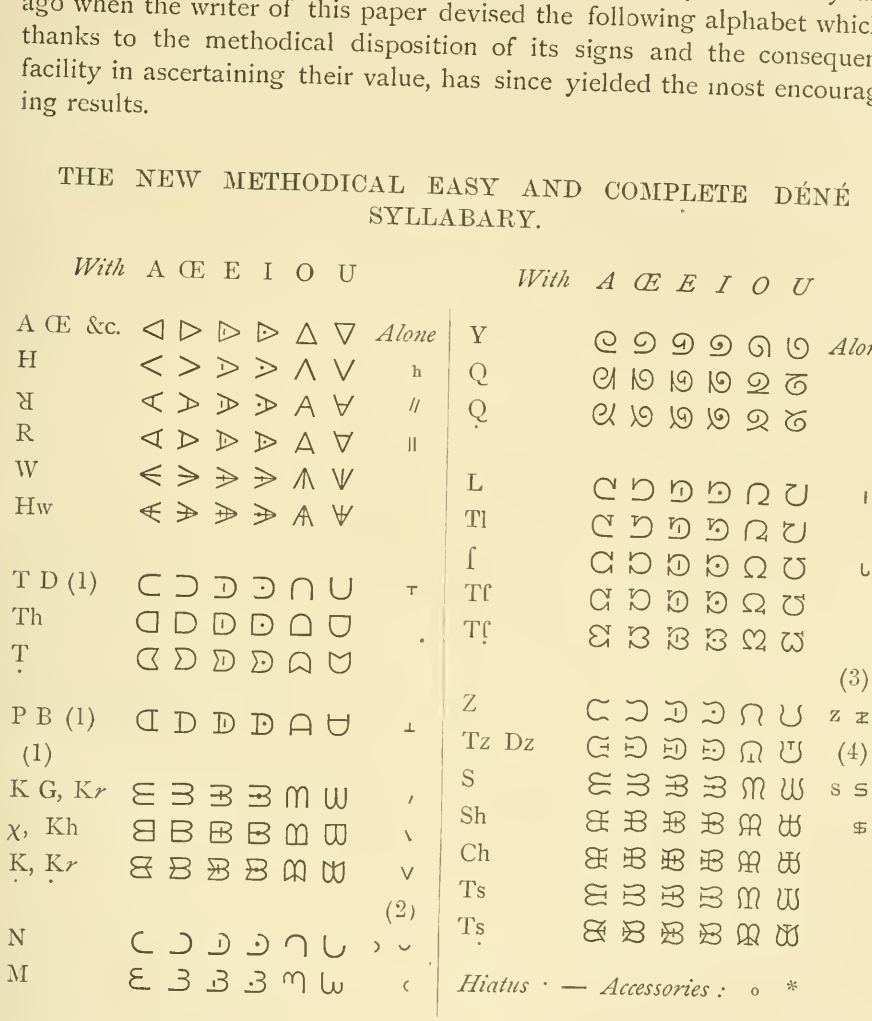
From which remarks I think I am warranted in deducing the, to me, self-evident conclusion that, in so far as the root words are concerned, the phonetical graphic signs of the Déné languages might be reduced, as in the ancient Semitic tongues, to the mere consonants.

No kind of writing ever obtained among the Dénés previous to the discovery of their country. The missionaries tried to adapt to the language of the Eastern tribes the syllabic characters invented by the late Mr. Evans. But as one of them, a pioneer in the Déné linguistic field well deserving of American scholars, the Rev. E Petitot, judiciously remarks: "cet alphabet qui est parfaitement suffisant pour exprimer les 20 lettres de la langue algonquine, est loin de répondre aux exigences de l'idiome déné-dindjié qui compte comme nous l'avons vu 71 sons phonètiques."*

**Précis de Grammaire comparée pp. XLIX. and L., Paris, Leroux éditeur, 1876.* Rev. Petitot counts as different sounds those produced by doubled or consecutive letters as *ss* and *tl* which circumstance accounts for the difference in our computation of the Déné phonetics.

Moreover, the signs of that alphabet are disposed without logic or method, which is a very serious defect when it is a question of syllabics. No effort had been made to remedy this palpable deficiency until five years ago when the writer of this paper devised the following alphabet which, thanks to the methodical disposition of its signs and the consequent facility in ascertaining their value, has since yielded the most encouraging results.

THE NEW METHODICAL EASY AND COMPLETE DÉNÉ SYLLABARY.



Explanatory Notes. — (1) These letters are not differentiated in Déné. (2) ᴗ is the nasal *n*. (3) ʒ is the French *j*. (4) ʂ is phonetically intermediate between ɕ and *s*. * is prefixed to proper names, and ₀ is suffixed to syllables the vowel of which it is necessary to render long.

CHAPTER II.

GENERAL CHARACTERISTICS OF THE DÉNÉ LANGUAGES.

It would be difficult to assign in one word the place which the Déné languages occupy among the chief classifications into which modern philologists have divided the human speech on the basis of its grammatical structure. Certain writers, and even eminent scholars, too fond of generalizations, have given as characteristics of the American languages traits which really pertain only to some of them. W. von Humboldt pointed to the agglutinative tendency of their verbs as to their chief characteristic* and Wiseman quotes in support of this view Malte Brun's remark to the effect that "this wonderful uniformity in the particular manner of forming the conjugation of verbs from one extremity of America to the other favours in a singular manner the supposition of a primitive people which formed the common stock of the American indigenous natives."† Now, it so happens that the Déné verbs are not formed by agglutination,‡ and are just as inflected as the Latin or Greek verbs.

More recently Dr. J. Hammond Trumbull, in a paper, otherwise full of valuable hints concerning the peculiarities of the American languages considered as an independent linguistic group, makes the following remarks, the first of which he emphasizes by the use of italics: "*The Indian noun is not separable as a part of speech from the verb.* Every name is not merely descriptive but *predicative.* . . In short, every Indian name is in fact a verb."§ Yet, with all the respect due to such an authority on American philology as Dr. Trumbull, I must state that there are in Déné many nouns which have no relation whatever to the verb; nay, the great majority of them is altogether independent therefrom, and they are just as purely nominative as the English "house," "lake," "bear," etc.

In a former paper I have referred to the remarkable propensity of the Déné nation for the self-appropriation of foreign practices and customs. Its language likewise presents to the investigator features so varied as to suggest a mixed origin for the whole stock, but more especially for the Western tribes. It is at the same time compounding, agglutinative, inflective, and polysynthetic.‖ Not, of course that it possesses each and

* *Apud* Wiseman, xii Lectures on the Connection betw. Science and Revel. Lect. II. p. 82.

† *Ibid.*

‡ At least as this word is now understood and applied by philologists.

§ Transact. Am. Philol. Assoc. 1869-70.

‖ I apply to these epithets the sense given them in the 2d Edit. of Powell's Introduc. to the Study of Ind. Lang. p. 56.

every one of these attributes in each and every one of its component parts. But I do affirm that we find them all in the language considered as a whole. In other words the Déné has patent affinities with the Aryan, Turanian and Semitic tongues. This I hope to prove to the satisfaction of the reader in the following chapters.

Another assertion still more common in philological writings and, in the light of the Déné vocabulary, quite as groundless as the preceding ones, is that abstract terms and words expressive of generality and collectivity are wanting in the American languages which are represented by some superficial observers as awkward in their syntax and very limited in their vocabulary. I admit that we must not look to the Déné idioms as to models of phraseological conciseness. That most important property of a language, the power of expressing without periphrases the subtlest efforts of the human mind, is somewhat wanting in the speech of our Aborigines, whilst terms expressive of those abstract ideas the accurate rendering of which constitutes linguistic perfection are not, I must confess, over numerous. Yet the philologist who wishes to propose for the guidance of students a rule of general import should, it seems, previously examine whether it is not too sweeping in its comprehensiveness. That words expressive of abstractness are not altogether wanting in Déné will be proved by the following nouns taken from the Carrier Vocabulary :—

Tli, cold (as affecting human body)
Hok̇wœz, cold (referring to the temperature)
Sœl, warmth
Tsazœl, heat (of the sun)
Hwozœl, heat (of the temperature)
Tlo, smile
Tso, weeping
Ni, cares
Shœn, witchcraft
Pœſ, sleep
Shih, French "*essoufflement*"
Qan, old age
Tai, famine
Nœtî, effort (physical)
Nîni, pleasure
Ṭsus, kiss (childish)
ʁœſ, diurnal revolution of time
Nûntsé, bleeding of the nose
Hok̇ôs, haze
Na-k̇ôs, snow-haze (lit. eye-haze)
χwœs, cough
Unih, jealousy
Nœtqœt, fear
Tsaſkœs, obscurity
Yœχaih, daybreak
Unṭé, love
Nœtai, dance
Nôyé, play
Yathœk, talking
Yuyuz, whistling
Huzœſ, time
Neni, human mind
Nezœl, human soul (animating the body)
Netsîn, second self

Nœta, Indian game (Chinook: *lahal*)
Atlih, Indian game (played with small sticks)
Chahwozun, hunger
Khu, vomiting
Œltoh, cramp
Tata, disease
Œltsœſ, bodily pain
ſtzi, shivering
Œtenkoh, work (to be done)
Lla, manual labor
Thih, frost
Mœssai, Latin, "*nihilum*," French, "*néant*"
Nezuſ, human shade*
Hwolna, difficulty
Hwol·é, easiness
Œtata, olden time
Horwœnœta, ceremonial banquetting
Thœſ, kick
Yaſ, locomotion on two feet (human)
Kwœſ, locomotion on four feet (and of birds)
Kral, locomotion by running
Pih, " " swimming
Khe, " in canoe
Kwœz, " nsleigh, etc.

Besides, the third person singular of several verbs is also used to render our abstract nouns.

On the other hand, collectivity may be said to be expressed by such words as *tœtai*, ducks (of any species); *tœtai-yaz*, birds; *ʌœnnai*, animals, etc. To these might be added, *œra*, French, "*poils*," and derivatives; *ne-na*, eyes; *ne-tzo*, ears; *ne-lla*, hands; *ne-khé*, feet; *ne-kran*, arms, which, though singular in form, are plural or collective in meaning.

Lastly. *neſœtsîn*, *neſthœs* mean respectively "brother" and "sister" in the indefinite or general sense; *nethœs* stands for ancestor without reference to his or her sex or degree of anteriority; *neîlken* qualifies any kinsman or kinswoman; *neke-khé* has almost the same signification, etc.

However, I must admit that the Déné languages are rather poor in such vocables. This lexical scarcity is a source of embarrassing perplexity to the student who has not yet acquired the mode of thinking proper to the Indian mind. To express, for instance, abstract ideas, one must frequently have recourse to periphrases which, as a rule, are far from rendering the exact meaning of the Aryan speaker. Not only are those languages deficient in the abstract *form* of many words, but even those sharp distinctions between the multiform operations of the human mind, those subtle and varied feelings which agitate our heart, seem to be perfect mysteries to the Déné idioms. A single sentence or periphrastic locution is all that the Carrier has at his disposal to give utterance to such varied movements as sorrow, melancholy, repen-

*See *The Western Dénés*, Proc. Can. Inst., Oct. 1889, pp. 158, 159.

tance, morosity, displeasure, etc. When moved by any of these or cognate sentiments, he will never say but : *stzî ndœta*, "my heart is sick." In like manner, such widely different moral qualities as goodness, beauty, handsomeness, holiness, liberality, magnanimity, benignity, sweetness, etc., not only cannot be expressed under their abstract form, but even when presented in a concrete shape, as a personal attribute, they have no other synonyms in Déné than *nzu*, "he is good."

Genuine synonyms in those languages are exceedingly rare. In fact I hardly know of any two words employed in one village to express exactly the same object or action. Homonyms there are, but even these are wonderfully scarce. Quite a number of words would indeed present to the unobservant linguist appearances of phonetical identity ; but no native ear will ever mistake, for instance, *sa*, "sun" for *sa'*, "a long time ;" *ntsi*, "your head," for *ntsi'*, "he is bad," etc.

On the other hand, owing to that synthetical disposition of most of the Déné verbs, which is but imperfectly developed in our idioms, perfect equivalents between that language and ours are—barring those terms which are roots in Déné—rarer than a hasty observer would at first imagine. As a proof of this assertion, let me open at random my Dictionary of Carrier Verbs. One of the first words that falls under my eyes is the French verb "Briller," to shine. As an equivalent, therefore, I have written down *pœ-sa-udœnat*. Now, while that term is certainly the nearest synonymous word that could be found to render the idea represented by the French vocable, it must be confessed that it is more restricted in its meaning. *Pœ-sa-udœnat* (literally : "the sun strikes it") denotes a kind of brilliancy caused by the reflection of the solar rays upon a polished surface, and could but improperly be used in connection with an object shining at night through the agency of fire or some other cause.

A little lower down, in the same column of my dictionary, I find the word "Brisé (être)," to be broken. In spite of its 150,000 or so verbal terms, the Carrier vocabulary does not contain a single genuine equivalent therefor. But, to compensate for the lack of that term, what a prodigious exuberance of differentiating forms ! Here I must respectfully demand of the detractors of Indian languages a moment of attention. In lieu of the single Aryan term, the American dialect under review possesses no less than 110 particularizing substitutes, not one of which could be indifferently used for the other. They are expressive of—1st, the object employed to operate the breakage, viz., the fists or the feet, a stick or a whip, or of the cause of such action as the wind, the explosion of firearms, etc.; 2nd, the manner in which the object has been affected, that

is whether it has been broken in one place or in many, by the middle or otherwise, purposely or by accident, violently or by gentle pressure; 3rd, the form of the object, qualified, that is whether it is elongated or spheroid, occupying a vast place or not, etc.

Moreover these 110 distinct verbs can be multiplied by four or five according as we give them the iterative, initiative, terminative, etc. forms whereby their signification is also changed. For, as we shall see further on, these forms are not mere modes in the usual sense of the word. Now, where is the Aryan or even the Semitic language which can boast of such lexical richness?

Nor should we overlook the fact that this wonderful discriminative faculty is displayed in connection with each and every instrumentative verb, and that almost any other class of conjugatable terms is even superior in the variety of its forms and the precision and nicety of its distinctions. Let us choose, for instance, the verbs of locomotion. The single paradigm of the verb "to go" includes in my dictionary verbs that are totally different according as to whether the locomotion thereby expressed takes place on two or on four feet, by running or hopping, tottering as a drunk man or with the help of a staff, creeping like a snake or jumping as a frog, swimming or floating, packing or skating, playing or in a state of madness, whistling or speaking, singing or grumbling, laughing or weeping, in sleigh or in canoe, paddling or sailing, diving down or in parallel line with the surface of the water, etc.—also according as to whether the movement is that of an empty canoe or that of the sun, the stars, the clouds, the wind, the snow, the rain, the water, the earth,(*i.e.* relatively to a person drifting down stream), the fire, smoke, fog, ghosts, human mind, feather down, disease, news, etc.—or again, whether it is that of an object elongated or spheroid, heavy or light, liquid or liquefiable granulated, massive, soft, etc., etc.

Furthermore, let us suppose that such varied locomotion takes place in the water and *all* of these individually different verbs will be materially altered; in the fire, and a similar—not identical—variation will result. Nor is this all. By giving them the negative, usitative, causative, causativo-potential, defective, reciprocal, initiative, terminative and iterative forms, each and every one of them will thus be multiplied by the number of forms assumed. And all the other verbs of locomotion can be affected by similar mutations!

Now perhaps I shall meet with incredulous readers when I affirm that this fecundity of the locomotive verbal stems is still surpassed by the prodigious particularizing power evidenced by the objective verbs. Yet this is a mere fact. I will not attempt even a reduced enumeration of

their forms. What I have already said will, I trust, give a fair enough idea of the differentiating superiority of the Déné over the Aryan languages. I shall content myself with stating that the single paradigm of the verb " to put " contains in my dictionary (which could be more complete) over 3,000 verbs all of which differ in meaning as well as in material structure. And this number is repeated in connection with almost all the other objective verbs, which are quite numerous ! And to say that a child four or five years old possesses these innumerable vocables well nigh as perfectly as does his father and knows his extricate language infinitely better than any French academician does his own plain and easy mother tongue ! Who will now vaunt the so much extolled mental superiority of the white race and despise the intellectual capacity of those poor " savages " ?

But we must descend from the heights of admiration to the more prosaic task of rapidly analyzing the different parts which constitute this wonderful speech.

CHAPTER III.

THE NOUNS ; THEIR VARIETIES AND INFLECTIONS.

There are in Déné but eight different parts of speech : the noun, the adjective, the pronoun, the adverb, the verb, the postposition, the conjunction and the interjection. Besides the verbs, the immense majority of the adjectives as well as many nouns and a few adverbs are susceptible of conjugation.

Considered in their material structure and etymology, the Déné nouns may be divided into four classes. There are the primary roots which are all monosyllabic as in Chinese. Such are *ya*, sky ; *thû*, water ; *tsé*, stone ; *sæs*, black bear, etc. They are essentially nominative : they neither define nor describe the object they designate ; they merely differentiate it from another. I consider them as the remnants of the primitive Déné language, inasmuch as they are to be found with little or no alteration in all the dialects of the family, whatever may be the distance intervening between the Aborigines who speak them.

The second category comprises roots of simple import which are genuine unsynthetical substantives though polysyllabic, generally dissyllabic, in form. To this category belong words as *tœne*, man ; *tsèkhè*, woman ; *pœngræn*, lake, etc. They possess, to a limited extent, the properties of the monosyllabic roots, being likewise merely determinative and oftentimes varying but little with the change of dialect.

The third class contains composite nouns formed, as a rule, by compounding, though sometimes by agglutinating, monosyllabic or dissyllabic roots. Such are *ne-na-pa-ra* (literally: man-eyes-edge-hair), eye lashes; *tæpe-té*, wild sheep horns; *mai-re*, vegetable oil, instead of *mai-ʌe*, literally fruit-oil. These nouns being mere compounds of roots belonging to the two former categories have the same degree of relative immutableness with regard to the various dialects as the radicals which enter into their composition.

The fourth and last class is made up of verbal nouns which, as their name indicates, are nothing else than verbs in the impersonal or personal moods employed to qualify objects of secondary import with the help, sometimes of a radical noun, sometimes of a pronoun, and always of a prepositive particle prefixed to, or incorporated in, the verbal substantive. Of this description are the words *pe-yœn-œlq̇œl* (lit. with-earth-one-cleaves), plough; *u-kwœt-ṫsœzta* (lit. it-on-one-sits), seat; *œten-pa-yœʌ* (lit he-works-for-house), work-shop. These and similarly formed words are the only terms which fall under the too comprehensive remark of Dr. Trumbull quoted in the previous chapter.

Of these four classes the first may be said to comprise about two-fifths of the whole aggregate of nouns, the remainder being distributed in almost equal proportions among the three other categories.

In the foregoing we must not fail to notice two grammatical combining processes common to some Aryan idioms, compounding and agglutination. A third process of a different nature, change of meaning by intonation or vocal inflection obtains also among some—not all—of the Déné tribes. Some of these intonations are even proper to fractions of tribes only. Thus *ya* which means "sky" in almost all the dialects becomes "louse" to a Southern Carrier when pronounced in a higher tone. Northern Carriers have another vocal inflection which is combined with the final hiatus and is also peculiar to them. Among them *œlla* means "hands" (of an animal): with the final hiatus it becomes *œlla'*, "bark" (of the spruce). *Stsé* corresponds to the English "my stone," by adding to which the hiatus inflection we obtain *Stsé'*, "my daughter" (as named by the father).

Judging by the restrictive notes contained within the parenthesis we perceive that the Déné nouns are no exception to the rule common to most Indian languages which ascribes to the substantives the property of connotiveness in addition to that of denotiveness. But I must hasten to remark that, apart from the polysynthetic compounds which are connotive by reason of their synthetism, this rule applies only to a limited

number of nouns. Among the essentially connotive nouns we find the names of the parts composing the animal body. Thus, although the real root for the word "heart" in its indefinite sense is *tzî*, this monosyllable is never employed alone. Though you may not specify it in English, the word used in Déné particularizes the nature of the heart referred to, viz., whether it is human, or simply animal. In the first case, the root *(tzî)* must be preceded by the particle *ne*, the radical element in *tœne*, man. Were we to replace this by the prefix *œ* which contains an idea of vagueness or indefiniteness, we would thereby refer to the heart of a dead animal such as that which might lie before a surgical student for the purpose of dissection.

This last prefix *(œ, é, i, a, u, ko, kwo,* etc., according to the dialects,) constitutes the only semblance of an article of which there is any trace in the Déné languages. It precedes certain monosyllabic roots or compounds of monosyllables such as, in Carrier, *œṭan*, leaf; *œṭo*, nest; *œra-pa-tsœl* (lit. hair-for-awl) needle. It has some affinity with the Hebrew prefix article הַ הָ הִ. That would-be article, like the ל of the original הַ ל is assimilated by the vowel of the possessive pronoun or the desinential letter of the words with which it is agglutinated. Thus, "his nest" is said *u-ṭo* instead of *u-œṭo*, and the prefix *œ* likewise disappears in such compounds as *soh-ṭo*, "robin-nest," *tœræs-ṭan*, "aspen leaf," etc.

The Déné dialects lack declensions of any description. As in the modern analytic tongues of Aryan descent, the office of the cases is, with one single exception, filled by prepositions or rather *post*positions; for in Déné, as in the Turanian idioms, it is a general rule that the governed word precedes the governing. The exception is the genitive or possessive, which is expressed as in English by first designating the progenitor or possessor and then prefixing the possessive pronoun in the third person to the word denoting the offspring or the object possessed. Thus *Wil-yam u-yœn* has exactly the same signification as the semi-Saxon "Willelm hys lond," a disintegration of the original "Willelmes lond," which has come down to us under the modern contracted form "William's land."

The possessive pronoun affects some nouns to such an extent as to impart to them a genuine inflection, in fact an inflection which, viewed in the light of the Déné phonology is even more radical than that of the Greek or Latin cases, since the element thereby inflected is not, as in those languages, the vowel which in Déné is unimportant, but the consonant which constitutes the quintessence of the word. For instance *ʃi* is the Carrier monosyllable for "dog," which, when affected by the possessive pronoun becomes *s-lœk*. Its Chiʃχohṭin equivalent *tʃin* is equally

changed into *sœ-llik* when in contact with the possessive pronoun of the first person singular. *ɣe* means "grease" the possessive of which is *u-rwe* at third person singular.* Were there no other cases of consonantal inflection in the languages under study, I think these might suffice to confirm the truth of Horatio Hale's assertion that "the opinion which prevails widely among scholars . . . that the languages of the Aryan and Semitic families are the only tongues in which genuine inflections are to be found . . . is utterly erroneous."†

In common with the Mongolian idioms, the Déné has no genuine plural. When absolutely necessary, that number is expressed, not by the adjunction of a pluralizing consonant as the *s* of many modern Aryan languages, or by a vocalic inflection as in Latin and Italian, but by the adjunction of such adjectives as *ɬai*, "many," or *tsiyauh*, "all." This rule applies to all the nouns (except *ɬi*, dog) expressive of non-human beings. Personal names form their plural by suffixing the particles *khé*, feet (which is also applied to *ɬi*), or more frequently *ne*, root of *tœne*, man. Only two nouns of the Carrier dialect *tsèkhè*, woman, and *tekhé*, relation, undergo a vocalic mutation when in the plural number, becoming respectively *tsèkhô* and *tekhô*.

As in Hebrew—but *minus* any suffix corresponding to the Semitic dualic increment—the names of those objects which are twofold by nature, as the eyes, the hands, etc., are intrinsically dual in meaning though singular in form. To obtain the grammatical singular, one must add to the Déné vocable the participle *kœz*, contraction of *œkœz*, "half." Therefore *ne-lla* refers to both (human) hands, and to get the singular we must say *ne-lla-kœz*, "(human)-hands-half."

Grammatical gender is likewise unknown in Déné, and this is again a link of affinity with the Turanian languages. When necessity requires a generic distinction, it is obtained as in Japanese, by the use of the words "man" and "woman" which, for the purpose become adjectives and mean "male" and "female." Here I cannot resist the temptation to point out the remarkable terminological analogy existing between the Japanese word for "male" and that used by the Chippewayans, one of the most important of the Déné tribes. This term is *yu* in both languages. The Chiʃχohtins replace it by *yosz* which also reminds the linguist of the Japanese *osz* which has the same signification.

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* To fully appreciate the inflectiveness of these and similar words one should bear in mind that there is in Déné as much difference between *l* and *ɬ* and *ɹ* and *r* as between any two non-transmutable consonants of the English alphabet.

† *The Development of Language*, Proc. Can. Inst. Oct. 1888, p. 114.

The names of some mammals, however, change with the sex, and a few have even a neuter gender, as is the case with the name of the caribou which in Carrier is *hwotsih* for the neuter, *œtœten* for the masculine, and *œmma* for the feminine genders.

The peculiar differentiating tendency which we have already noticed in the verbs, extends also to the names of a few fur-bearing animals. Among these we find the beaver whose name is *tsa*. His offspring, when under two years of age is called *tsa-tsél* in Chiſχohtin. But when the animal has seen two winters, it receives the name of *khoq*, which after its third winter is exchanged with *œtqal·il*, which alludes to its being of age to be mated.

The Déné dialects possess diminutive and amplificative forms which are obtained conformably to the Japanese method with this difference that, while the Japanese *pre*fixes to the nouns the words *ko*, " child," and *o*, " big," the Déné *suf*fixes thereto the words *yaz* and *cho* which have exactly the same signification.

CHAPTER IV.

THE ADJECTIVES AND THE PRONOUNS.

As heretofore stated, the quasi totality of the Déné adjectives are genuine verbs. Indeed the only real adjectives that do not admit of the possibility of conjugation, are, in the Carrier dialect, *œyu*, another, and *tsiya*, all. *Œstel*, naked, *yuya*, ashamed, *tannrwœz*, cylindrical, *tsachéskhwœn*, red hot, might pretend to the title, but their native form and use are more that of adverbs than of real adjectives.

This being the case, it follows that intrinsic forms of the comparative and of the superlative are no more possible in that dialect than in Hebrew. Their function is filled, as in the Semitic tongue, by some circumlocution. To obtain the comparative the Carriers use the adverb *onnœs*, more, before the adjective, and say, for instance: *onnœs nzu*, " more (he is) good " for better. The superlative, when suggestive of no comparison, is rendered as in English by adverbs corresponding to our " very, much." When it implies some comparison, its expression offers in Déné greater difficulty. In Carrier, we generally make use of some comparative adverb as the above mentioned *onnœs*, or more appropriately the particle *kœs*, both of which are coupled with the relative pronoun *(e, èn, ène* or *ne)* in this wise: *kœs nzu e*, " the best" (thing). Sometimes a

periphrastic circumlocution takes the place of our superlative, and this is particularly the case among the Eastern Dénés. Thus, according to Petitot, to translate : " my mother is the best of mothers," a Chippewayan would be inclined to say : " mothers all anyhow my mother alone is good." The only intrinsically formed superlative is that of the locative and ordinative adverbs or adverbial-adjectives. Its distinctive element is the prefix *œte*, applied to the adverb in its natural state as *œte-no*, the most northern ; *œte-yo*, the lowest ; *œte-tiz*, the nearest (in distance) ; *œte-tsâ* the first (in rank or age) ; *œte-chu*, the first (in the succession of time), etc. This genuine superlative is proper to the Carrier dialect.

A peculiar comparative of similitude obtains through the whole linguistic group. But as it is essentially incorporated in the verb, I simply mention the fact in this connection.

I deem it more relevant to associate with the regular adjectives the demonstrative pronouns which, together with the numerals, have in Déné the same material features and follow the same rules as the two genuine adjectives *œyu* and *tsiya*. These rules have reference to their place in the sentence, viz : immediately before the noun, and their grammatical accord therewith, to understand which a word of explanation is necessary.

The broadest division of the substantives grammatically considered and the only one which affects in any way the unconjugatable adjectives and the demonstrative or relative pronouns connected therewith, is that which differentiates the names of human from those of non-human beings. It has for effect to demand the addition to the adjective of an *n*—from *tœne*—for the singular, and of the suffix *ne* for the plural of adjectives relating to human beings. Thus *œyu* means " another (thing)," *œyun*, " another (person)," *œyune*, " other (persons)."

The same remark applies—barring what has reference to the plural—to the numeral adjectives. These are quite rich in variety of forms. In Carrier *tha* means three (things) ; *thane*, three (persons) ; *that*, three times ; *thatœn*, in three places ; *thauh*, in three ways ; *thaîltoh*, all of the three (things); *thahœltoh*, all of the three (persons) ; *thahultoh*, all of the three times, (places or things—massive or spacious). Most of the Eastern dialects lack all but the three first forms. Neither do they, as a rule, possess the ordinal numbers which are expressed in Carrier by the cardinal adjectives preceded by the postpositions (which for the purpose become prepositions) *pœl* or *hwol*, " with it," in this way : *pœl thanœu*, " with him three " (persons) or the third ; *hwol that*, " with it three times," or the third time, etc.

In common with the ancient Egyptians and most American aborigines the Dénés use their fingers to count upon, and their system is decimal. Holding his left hand with the palm turned toward his face, the Carrier will bend with the index of his right his little finger and all the others in succession. Then he repeats the same operation on the fingers of his right hand whose palm is this time turned outside, the number six being named on the thumb. That number is *ſkœ-tha,* "on both it is three" (things), and eight is in like manner *ſkœ-tœnnge,* "on both it is four" (things). The expression used for nine recalls to mind the ἑνὸς δέοντος of the Greeks. The Dénés likewise say: one is wanting (*i.e.* to ten). Ten is *hzwonízyai,* "it is won," in Northern Carrier. For eleven all the tribes say ten *plus* one, etc.; for twenty, twice ten, etc., and before the advent of the whites the Carriers said for 100, *pe nahultho,* "with it one counts again."

Another analogy with the Greek language perhaps worth mentioning is that existing between the Déné interrogative pronoun *tî?* "what?" and its Greek synonym τί; all other Carrier interrogatives are similarly characterized by the initial consonant T which corresponds to the initial τ noticeable in all the Greek pronouns of that class. But enough of this. My intention in commencing this paper was to ignore mere lexical analogies with alien languages.

Of personal pronouns all the Déné dialects possess two kinds. The first is subjective and independent from the verb. It is identical with the Latin *ego, tu, ille,* etc. The other is so incorporated into the body of the verb as to lose its own individuality. It is the equivalent of the pronominal crement we notice in the Latin and Greek verbs: *am-o, am-as, am-at,* etc., λύ-ω, λύ-εις, λύ-ει, etc. Of this last more shall be said when I come to treat of the verb.

Possessive pronouns assume in Carrier five different forms, according to the sugnification or the internal structure of the noun to which they are prefixed. The most noticeable peculiarity in connection therewith is the richness of the pronoun of the third person. While four words (his, her,its, their), seem sufficient to the English mind to express it, the Carrier idiom can boast of no less than 17 such terms which, however, when divested of their five accidental forms can be reduced to six: singular *u, hzwo, yœ, tœ*; plural, *pœ* and *he.* The first of these pronouns corresponds to our "his, her, its,"—the pronouns admit of no gender in Déné. The second *(hzwo)* is prefixed to nouns in regiminal connection with such words as "house, lake," and those which denote

extensiveness or indefiniteness. *Yœ* refers to a third completive person as in this sentence *Pol yœ-pa i-keſa-hwoſtsi*, Paul paid for him. By changing *yœ-pa* into *u-pa*, we would give to understand that *he* paid for Paul. The plural of this pronoun is *he*. *Tœ* has relation to the person whose action is expressed in the sentence. It is the exact equivalent of the Latin *suus, sua, suum.*

It will easily be understood that with such a convenient array of pronominal terms, amphibology is a mere impossibility.

In a late fasciculus of the "Proceedings" of the Canadian Institute, I was struck by a quotation from Peschel to the effect that "in the American languages the connected syllables (of composite words) are always curtailed of some sound."* This is another of the many erroneous statements of philologists, who, because they have obtained some knowledge of a few native tongues, are too prone to apply to those they are unacquainted with the Latin axiom: *ab uno disce omnes.* Or shall we exculpate them from the charge of temerity and lay the blame at the door of those who being in position to acquaint the philological world with new languages, did not take the trouble to do so? Be it as it may, Peschel could hardly find in the Carrier dialect one really composite word to which to apply his own rule. Nay, I think his remark would be more to the point in reference to such a highly inflected language as Latin than with regard to the confessedly polysynthetical Déné idioms, at least if we are to take such a word as *cadaver* as an abbreviated compound formed from *caro data vermibus.*

Still, the case might have been different in pristine times as the name (*Na-ka-ztli*) of the village where these lines are written would seem to warrant us to infer. According to a local tradition, a powerful tribe of dwarfs *(atna)* once attacked and well nigh swept it out of existence. As it is situated close by the outlet of this (Stuart's) Lake, the enemy's arrows, which were diminutive in proportions as the hands that used them, floated down the river in immense numbers. Hence, to give a graphic idea of the importance of the conflict, the ancients used to say to their children: the river was covered with the floating arrows of the enemy, *Atna ka pœſ tiztli*, which by contraction has become *Nakaztli.*

On the other hand, we find in connection with the pronouns remarkable instances of contractions whereby two words, a pronoun and a postposition, primitively independent have combined to form, not a regular composite word as those alluded to by Peschel, but a single monosyllable

* Proc. Can. Inst. April, 1889, p. 291.

possessing the meaning of the original two words. Here are examples in two different dialects.

Carrier Dialect.		Chiſχohtin Dialect.	
Sœſ, with me, for	s-p-œſ	Sa, for me, instead of	s-œp-a
Nyœſ, " thee,	m-p-œſ	Na, " thee, etc.,	n-œmp-a
Pœſ, yœſ, tœſ, hwoſ, him, etc.,	p-œp-œſ, y-œp-œſ t-œp-œſ, hwo-pœ-ſ	Pa, ya,	p-œp-a, y-œp-a
		nɹwa,	nɹo-p-a
Neſ	ne-p-œl	ɹwa,	ɹo-p-a
Nohwœſ	nuh-p-œſ	Kupa,	ku-pœ-pa
Opœſ, heyœſ,	opœ-pœ-ſ, hey-œp-œſ		

Of the adverbs I shall say nothing besides mentioning the fact that many of our adverbs have for equivalents in Déné non-adverbial particles incorporated in, or prefixed to, the verb as formative elements. The sequence will explain this peculiarity.

As for the conjunctions and the interjections they offer to the philologist nothing worthy of remark beyond this resemblance with the Mongolian or Tartaric tongues, that conjunctive terms are but seldom used, their number being reduced to a few indispensable words.

CHAPTER V.

THE SIMPLE OR PRIMARY VERBS.

The verb is indeed the word *(verbum) par excellence* in Déné. In fact, out of every twenty words of the language, I doubt whether there are two that are not susceptible of conjugation. Were it not for the verb the Déné grammar might be said to be devoid of serious difficulties. As it is, the multiplicity of the verbs, the varieties of their forms, the frequence of their irregularities, the intricacies of their negative elements and the almost unlimited possibilities of their combinations assign to the Déné idioms one of the first places among the most difficult languages known to Philology. The student should not anticipate in these pages a complete treatise on that most complex of the parts of speech. I am not writing a grammar and must confine myself to general outlines. Yet I hope he will miss in this and the following chapters very little of what is of real value to form a sound estimate of the chief characteristics of the Déné verbs. For the sake of perspicuity I shall treat here exclusively of the simple or primary verbs by opposition to the composite or synthetically constructed verbs which shall form the subject of another chapter.

A word concerning the modes, tenses, persons and numbers shall serve us as an introduction to the subject. As in the Hebrew grammar, there is, properly speaking, but one mode, the indicative, in the Déné dialects. The imperative can hardly be called a mode, since it is formed entirely of persons taken from the present tense and eventual future. This future furnishes also the equivalents of our subjunctive and optative. The infinitive does not exist. It is but imperfectly replaced by the impersonal.

As for the tenses, they are of two kinds : primary and secondary. The former are four in number, viz.: the present, preterite, proximate future and eventual future. The proximate future refers to the action as being on the point of taking place and corresponds to the English "I am going to." The eventual future is vague and aleatory in meaning and has no strictly exact equivalent in our languages. Each of these four tenses is expressed by a single word as in Latin and Italian. The secondary tenses are simply the primary tenses accompanied by auxiliary verbs or particles, as *ênle*, *ta*, *sih*, etc.*

The Déné verbs have three numbers as their Greek co-relatives. But while the dialects of the Eastern Dénés possess, as a rule, three persons for each number, the verbs of the Western Dénés have generally but one —the first—person for the dual. *Par contre*, their verbs of locomotion and their verbs of station have no less than sixteen persons for each tense, viz.: three for the definite singular, three for the indefinite singular, three for the plural and seven for the dual. Besides, all those verbs whose radical varies with the number, as is the case with the verbs of cubation, have always—unless they belong to one of the two categories above mentioned—ten persons.

Before submitting to the appreciation of the philologist paradigms illustrative of the foregoing, it will not be amiss to give a brief outline of the internal structure of the verb in general.

Every Déné verb, no matter of what form or tense it is affected, is composed of at least two distinct integral parts :—1st. a monosyllabic root which is always the desinential syllable of the verb and is generally—not necessarily—invariable ; and, 2nd, a pronominal crement which varies according to the person and the tense. This combination is identical

* In the dialects of the Eastern Dénés the tenses are, according to Rev. E. Petitot, the present, imperfect, preterite and future. In justice to the student of those dialects, I think it necessary for me to state that I am acquainted with missionaries ministering to the Eastern Dénés who speak in rather disparaging terms of that author's Dictionary and Grammar, and insinuate that, except as regards the Loucheux dialect, which he is recognized to have thoroughly mastered, both works are very faulty. Yet I hardly think that he could have erred in reference to such important points of Grammar as are the conjugations and tenses.

with that of the Latin and Greek verbs, with the unimportant difference that the formative elements in the Déné and Aryan verbs are disposed in inverse order.

Those persons who feel inclined to question the capacity of Indian languages for genuine inflections are respectfully referred to the following paradigms. I have disposed the Latin synonym side by side with the Carrier words, to show that the inflectiveness of the Déné verbs is not merely accidental, bnt pervades the whole conjugation.

PRIMARY TENSES OF THE VERB ŒSTEN, I WORK, I ACT.

CARRIER.	LATIN.	CARRIER.	LATIN.
Present.		*Proximate Future.*	
Sing: œs-ten	ag-o	Sing: œthîs-tiſ	I am going to act,
Sing: în-ten	ag-is	Sing: œthan-tiſ	(almost
Sing: œ-ten	ag-it	Sing: œthî-tiſ	acturus sum
Plur: œtsœ-ten	ag-imus	Plur: œzthî-tiſ	" es, etc.)
Plur: œh-ten	ag-itis	Plur: œthîh-tiſ	
Plur: œhœ-ten	ag-unt	Plur: œhœthî-tiſ	
Dual: î-ten	ambo ag-imus	Dual: œtha-tiſ	
Preterite.		*Eventual Future.*	
Sing: îs-ten	eg-i	Sing: us-ten	ag-am *
Sing: an-ten	eg-isti	Sing: oNn-ten	ag-es
Sing: î-ten	eg-it	Sing: u-ten	ag-et
Plur: œtsî-ten	eg-imus	Plur: œtsu-ten	ag-emus
Plur: îh-ten	eg-istis	Plur: uh-ten	ag-etis
Plur: œhî-ten	eg-erunt	Plur: œhu-ten	ag-ent
Dual: a-ten	ambo eg-imus	Dual: ô-ten	ambo ag-emus

* In a vague and indefinite sense.

Imperative.

Sing.	în-ten u-ten	Plur.	œh-ten œhu-ten
Plural :	œtsu-ten	Dual :	ô-ten

As illustrative of the formation of the secondary tenses, I shall give the following, with their Latin equivalents :

œsten înle	*Latin* : agebam
îsten înle	egeram
usten inle	egissem
usten sih	agam (definite), etc.

Of the primary tenses it may be said that the two futures are the most immutable in their pronominal elements, whilst the desinential root of the proximate future is of a rather changeable character. As for the preterite, instead of being invariably affected by a vocalic mutation of its personal crement, as is the case with the above example, it undergoes quite frequently consonantal variations, either in its radical or in its pronominal part, the *îs*, *ann*, etc., of which are often changed into *sœs*, *sîn*, etc.

Now for the sixteen persons of the verbs of locomotion and of the verbs of station :

Present Tense.

Definite Sing.	nœshya, I walk	sœsta, I am sitting
	nînya, thou walkest	sînta, thou art, etc.
	niya, he walks	sta
Indef. Sing.	nœtsiya, one walks	tsœzta
	nihya } See below	sœhta } See below
	nœheya	hœzta
Plural	nœtsœtiſ, we walk	œztîſtsi
	nœhtiſ, you walk	tœſtsi
	nœhœtiſ, they walk	hœtîſtsi
Dual	nœs·as, I walk (with one person)	sœskré
	nîn·as, thou walkest (do)	sinkré
	nœ·as, he walks (do)	œskré
	nœtsœ·as } See below	tsœzkré } See below
	nîtas	îkré
	nœh·as, you walk (two together)	sœhkré
	nœhœ·as, they walk "	hazkré

Some of these personal forms have no equivalents in any language that I know of, and consequently require a word of explanation. *Nœtsœ·as* and *nîtas* are distinguished practically by a slight difference of meaning only. *Nîtas* is the regular dual of concomitancy which implies that the locomotion is executed by both of *us*, while *nœtsœ as* substitutes to the idea of the first person that of the impersonal: one is walking *à deux*. *Nihya* and *nœheya*, with their co-relatives of the other tenses, also convey the idea of indefiniteness, but coupled with that of the second and the third person of the plural. For instance, a native orator, while giving orders to a group of fellow countrymen and unwilling to designate any one of them in particular, will say (in the eventual future): *nôhya*," you shall walk," meaning: *one* of *you* shall walk. Again, referring to an undesignated person in a crowd which he is not directly addressing, he might say in an indefinite manner: *nœhôya*, "they shall walk," that is, *some* unknown or purposely unnamed person among *them* shall walk.

The same remarks apply to the verb *sœsta* and derivatives. Should I say to a group of Indians: *tœltsi*, "sit down," all my audience will at once understand me. But if, instead, I were to say: *sœhta*—the pronominal element of which has the *h* characteristic of the second person plural, though the radical retains its singular form—the natives would immediately understand that I mean only *one* of *them* to sit down, and they would be at a loss to know who is to comply with my request.

Abstracting the many irregularities of the Déné verbs, all their inflections may be reduced to three conjugations, which are characterized by the consonant of the pronominal crement of the second person singular.* *n* denotes the first, *l* the second, and *l* the third. The verbs above conjugated—with the exception of the last *(sœsta)*, which, in common with some irregular verbs, takes for the singular and dual the characteristics of the first, and for the plural that of the second conjugation—all belong to the first. Here is the present of verbs of the second and of the third.

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*Petitot in his *Grammaire comparée* of the Eastern dialects counts four conjugations, three of which he bases on the pronominal *vocalic* inflection, the second being in *es*, the third in *as* and the fourth in *us*, while the first he states to consist in the mere juxtaposition of a personal pronoun to an adjective, a preposition or an adverb. On this side of the Rockies, we have no other equivalents of this uninflected conjugation—if conjugation it can be called—than five or six irregular verbs as *s-ra-hwolna·* (lit. me-on-account-of-difficulty), "I am difficult." I think it preferable to treat them as so many unimportant anomalies to making them constitute a separate conjugation.

Second Conj.	*Third Conj.*
œs-thœs, I am strong, etc.	œz-chan*, I am pregnant, etc.
îſ-thœs	îl-chan
ſ-thœs	l-chan
tsîſ-thœs	tsœl-chan
œſ-thœs	œſ-chan
heſ-thœs	hœl-chan
Dual : îl-thœs, we are both strong	îl-chan, we are both pregnant.

These and similarly constructed verbs are what I may call primary verbs. Their characteristic is the pronominal consonant of their third person singular (*n*, *ſ*, *l*,), which stands alone, unsupported by any vowel, and which differentiates them from the simple, but non-primary, verbs. These, although they are uncomposite in material structure, yet possess two distinct radicals: one preceding, the other following, the personal element which invariably occupies the penult place in all kinds of verbs. The following shall serve as an illustration thereof:

I. Conjugation.	*II. Conjugation.*	*III. Conjugation.*
nd-œs-ta, I am sick	t-œs-kœs, I am black	t-œz-χwœs, I cough
nd-în-ta	t-îſ-kœs	t-îl-χwœs
nd-œ-ta	t-œſ-kœs	t-œl-χwœs
tsœ-nd-œ-ta	œz-t-œſ-kœs	œz-t-œl-χwœs
nd-œh-ta	t-œſ-kœs	t-œſ-χwœs
hœ-nd-œ-ta	hœ-t-œſ-kœs	hœ-t-œl-χwœs
Dual: nd-î-ta, we are both sick	t-îl-kœs, we are both black	t-îl-χwœs, we both cough

A noteworthy feature of the Déné dialects is that, alone among many American idioms, they possess the substantive verb "to be" in its independent form; and, what is even more remarkable, that verb is, in Carrier and Chiſχotin, just as regular in its conjugation as any other verb of its class. However, it is used only in connection with a noun or the few adjectives or adverbo-adjectives mentioned in a previous chapter. Moreover, elegance demands that its use be corroborated by a kind of secondary substantive verb as in this phrase: I am a man, *tœne œstli hwe œstoh*, literally "a man I-am whereby it-is-I." Nevertheless this verb of redundance *(œstoh)* may be omitted without any change of meaning re-

*Chan means "womb," and the literal translation of that verb should read: "I *womb*, thou *wombest*," etc.

sulting therefrom, as its main object is simply to give emphasis and elegance to the sentence.

Naturally, the use of the substantive verb is incompatible with that of the Déné adjectives, which are of themselves genuine verbs, combining in their elements our personal pronoun, auxiliary verb, and adjective. I divide them into two classes : primary and secondary adjectives, the first of which, materially considered, correspond to the primary single-radicaled verbs, and as such fall under the scope of this chapter.

They usually express qualities of simple import, as "good, bad, great, small, wide," etc., and while in their primitive form they are merely denotive. All of them, in addition to the various forms which they are liable to assume as verbs, are also affectible by internal mutations connoting the nature of the object they qualify without, however, becoming objective verbs. Thus *n-cha* (third person singular of *œscha*) means "big," without pointing to any peculiarity in the subject ; *nîn-cha* is applicable to a sphere or a spheroid exclusively ; *dîn-cha*, to an elongated object and to vocal sounds ; *hun-cha*, to vastness or indefiniteness of proportions.* *Dœ-nîn-cha*, without being a composite verb in the estimation of the Déné grammar, yet combines two forms, *dîn* and *nîn*, and refers to such an article as a ring which is intended for an elongated object, viz., the finger (hence *dœ*, euphonical inflection of *dîn*), whilst it is of itself circular in form (hence *nîn*). A similar analysis applies to *hwo-dîn-cha*. In accordance with the law of euphonic sequence of the vowels, *hun*, qualificative of indefinite spaces, is changed into *hwo* ; *dîn* has reference to vocal sounds, and the whole compound denotes the peculiar resonance noticeable in the voice of certain persons whose speech seems to emanate from cavernous depths.†

CHAPTER VI.

THE COMPOSITE VERBS.

Polysynthetism has generally been regarded, and not without reason, as the chief characteristic of the American aboriginal verbs. It pervades the languages of the remotest tribes to such an extent as to permit of their being classed under one single denomination, despite their many terminological and grammatical dissimilarities. Yet that particular feature cannot be said to be their exclusive property. Many a verb of purely Indo-

* *Hun* and its co-relative *hwo* characterize also the Impersonal.

† Identical transmutations take place in many a non-adjective verb.

European parentage, for instance, can trace to a synthetical process its original formation. For what are such terms as *de-ponere*, *re-ponere*, *pre-ponere*, *ex-com-municare*, not to speak of their synonyms and derivatives in the modern analytic tongues, if not synthetical compounds? Scholars are also well aware of the role played in the formation of Greek words by such prepositions as κατά, μετά, ὑπερ, διὰ, etc. Nor should we forget the original synthetic verbs *át-standan*, *be-standan*, *for-standan*, *under-standan*, etc., of the early Anglo-Saxon, the main root of our own English. But as no other linguistic group displays this propensity for word agglomeration in such a degree and with such varied results, its claims to be regarded as the special characteristic of the American languages remain unimpaired.

The Déné dialects which, as we have seen, are distinctly inflective in the pronominal elements of their verbs, are also thoroughly polysynthetic in the formation of composite verbal terms. Indeed, it is to that peculiarity, coupled with the multiplicity of their sense-modifying forms, that we must look for the cause of the prodigious number of their verbs. It were tedious, as well as unprofitable for the purpose in view, to enter into the details of the several processes whereby two or more dependent or independent terms are united to compose a new word. A few representative examples will, I trust, suffice to give us an idea of the whole system. I have in a previous chapter hinted at the existence in the Carrier dialect of a comparative internally connected with the primary verbal adjectives and a few other verbs of simple import. This shall serve as our first illustration of synthetism as applied to the formation of the Déné composite verbs.

The primary verbal adjective *œssul* means "I am small," and its third person singular is *n-tsul*. With the help of the proper prefixes we obtain: *ndœl-tsul*, he is as small; *dœl-tsul*, he is as small as (with a complement); *nga-dœl-tsul*, he is as small as that; *pœ-ndi-yœl-tsul*, he is as small as he; *lœ-ndœl-tsul*, they are both as small, one as the other; *su-îl-tsul*, he is small enough; *ta-l-tsul?* how small is he? *lel-tsul!* how small he is! We must not fail to observe that the comparative prefixes have for effect to change the pronominal part of these verbs from that of the first to that of the third conjugation. Moreover, these and all other cognate verbs are susceptible of assuming, conjointly with the above prefixes, all the internal inflections assumable by a verb as verb, not counting those they can be affected by as primary verbal adjectives.

For simpler, and perhaps more intelligible, examples we will look to the verbs formed with the help of the particle *ta*, root of *tathi*, "door." By prefixing it to such verbs as *nœshya*, "I (human being) walk," we

will get, at the third person singular, *ta-nînya*, " he (hum. b.) walks in (the house)." Should we change the verbal stem, while retaining the modificative prefix, we might say : *ta-nînyût*, he drives in (the house), which, by further verbal modifications, may become *ta-nœyœk*, he usually drives in (the h.); *ta-nœtgût*, he is susceptible of being driven in (do.); *ta-nœtgœk*, it can generally be driven in (do.), etc. If we now try of the objective verbs, we may say, while still keeping the modificative particle : *ta-s'aih* I put in (the house a single object); *ta-dîstaih*, I put in (the house a single object) for my own use ; *ta-taih*, it (one single obj.) can be put in (the house) ; *ta-dîtaih*, it (do.) can be put in (do.) for one's own use ; *ta-stle*, I put in (the house many objects), etc., etc. Let us not, however, allow ourselves to be allured by the multiplicity of forms assumable by this and similar verbs. It would lead us to the enumeration of many hundreds of verbs before the supply is exhausted. For the same reason, we shall avoid *ta-s'is*, I throw in (the house a single obj.), which is the first of a new series of objective verbs.

Selecting less prolific forms for our word-building experiences, we come on *ta-ssâ* (lit. " I cry on the threshold "), I beg ; *ta-næs'a*, I order in ; *ta-hwœjyi*, I enter while playing ; *ta-næstsas*, I enter while throwing sticks on the snow ;* *ta-dœzni*, I introduce my hand in (the house) ; *ta'-næskra*, I introduce my finger in, etc., etc.

Some verbs of as simple formation connote an even greater number of ideas. For instance, *ntsi'*, " he is bad, avaricious," while preceded by the aforesaid prefix *ta*, becomes *ta-ntsi'*, which we cannot well translate in English by less than nine words, viz.: " he proves avaricious to those who enter his house." So that if it is true to say that a single idea expressed in one Aryan word frequently requires a periphrase in the American languages, it can be retorted that sometimes short native verbs cannot be translated by less than a whole sentence in our idioms. Nay, the Carrier dialect might even, with some respect, be adduced as a model of phraseological conciseness. As a proof of this, it may suffice to quote the conjugatable adverb *'a*, which means " promptly." To any person requiring of a native courier, for instance, to cover, in one day, a distance of 70 or 80 miles the latter might simply answer : *u'a gœnnih* (lit. it-shall-be-promptly let-it-not), the real signification of which is : " one cannot reasonably expect that I should do it in so short a time." Same remark applies to *sa'*, a long time ; *lat*, often ; *su*, well ; *niltza'*, far ; *niltuk*, near, etc., which are similarly conjugatable.

To return to the composite verbs. A slight analysis of the examples

* Indian game much in favor during the winter months.

given above will result in the detection of two radicals : a primary root, which is always the final syllable of the verbal stem, and contains the key to the main signification of the compound,—and a secondary radical, which precedes the personal element, and alters the sense of the primary root. Thus the *ya* of *ta-næsh-ya* indicates that a human being is walking on two feet, and the prefixed particle *ta* furthermore denotes that such locomotion takes place from the outside to the inside of a habitation.

Now if, in lieu of experiencing with a permanent initial particle, we should retain instead an immutable desinential radical, we might successively prefix thereto various initial radicals, whereby new words with new meanings would be formed. *Tzaih*, for instance, is the desinential root of such objective verbs as have for complement anything of a granulous nature. We shall prefix thereto the particle *thé*, whereby—with the incorporation of the pronominal *s*—we obtain *thé-stzaih*, (I take out (of the house gran. obj.), which may be further modified into *ha-stzaih*, I extract (gran. obj.) from ; *kæ-stzaih*, I put (do.) on ; *pe-stzaih*, I put (do.) in (a recipient) ; *hwe-stzaih*, I take (do.) away ; *hwosa-stzaih*, I bring (do.) to myself; *nenæ-stzaih*, I lay (do.) on the ground; *na-stzaih*, I drop (do., do.) ; *nîntha-stzaih*, I put (do.) in the wrong place, that is, I lose, etc.

From which we conclude the existence in Déné of two chief synthetical processes, viz., one whereby the verbal stem is changed while the initial prefix remains invariable, and the other which retains the verbal stem unaltered, while it prefixes to it divers modificative particles.

On the other hand, a primary radical may be modified by many a secondary radical, or formative particles performing the office of radicals. Instead of *ta-næshya*, for instance, we might say *ta-na-næsqa*,* I walk in again ; *ta-na-hwe'-næsqa*, I only begin to walk in again, etc.

Nor should a student, desirous of seeing in all its expansion the wonderful power of composition peculiar to the languages under review, stop at the examination of compounds resulting from the prefixing to a verbal stem of merely one or two sense-modifying particles. To give him an idea of what it can lead to, I shall introduce him to the verb *ſe-kæ-na-hwe'-shæn-dæ-thæ-næz'-krok*, which is a simple word, meaning: " I usually re-commence to walk to and fro on all fours while singing." Shall we analyse it ? Let us try. *ſe* is a prefix expressive of reciprocity, which, when in connection with a verb of locomotion, indicates that the movement is executed between two certain points without giving prominence to either ; *kæ* denotes direction towards those points ; *na* is the

* *Qa* is the equivalent of *ya*, such as inflected by the iterative particle *na*.

iterative particle suggesting that the action is repeated ; *hwe·* refers to the action as being in its incipient stage ; *shæn* means "song," and when incorporated in a verb it indicates that singing accompanies the action expressed by the verbal root ; *dæ* is called for by *shæn*, said particle always entering into the composition of verbs denoting reference to vocal sounds ; *thæ* is the secondary radical of the uncomposite verb *thîzkret*, inflected from *thî* for the sake of euphony with *nœz*, the pronominal crement of the whole compound, the *n* of which is demanded by the previous *hwe·*: *æ* characterizes the present tense, and *z* the first person singular of the third conjugation ; while *krok* is the main radical altered here by the usitative from the normal form *kret*, and is expressive of locomotion habitually executed on four feet or on all fours.

To enable the student to penetrate still further into the synthetism of the Déné verbs, I give below lists of the principal word-formative particles, together with examples illustrative of their use.

The following are postpositions with regard to their complement—noun or pronoun—and prepositions relatively to the verbal stems to which they are prefixed :—

AFFIXES.	EXPRESSIVE OF	EXAMPLES.
χa, χwa*	desire	n-χa-nœszœn (lit. thee by desire of I think), I want thee
ḱé, ḱwé	love	u-ḱwé-ssâ (him-through love of-I cry), I pine after him
ḱœn, ḱwœn	reference	ho-ḱwœn-nahwœlnœk (it-about-he narrates) he relates it
ḱœnne, ḱwœnne	deference	s-ḱœnne-inten (me-in deference to-work), obey me
ṭſa	transmission	pœ-ṭſa-s·ai (them-in-hands-I-put), I passed to them
lla	co-operation	ne-lla-îten (us-hand in hand-he worked), he helped us
q̣a	opposition	hwot-q̣a-sœ-nîyût (it-opposite to me-he drives), he prohibits it to me

*When in connection with the indefinite completive pronoun *ho*, and sometimes the personal pronoun *u*, the *χ*, *ḱ*, of this and the following postpositions are inflected into *χw* and *ḱw*.

The following affixes preclude the possibility of union with a complement, and are so intimately connected with the verb as to possess of themselves no separate existence :—

AFFIXES	EXPRESSIVE OF	EXAMPLES.
hwosa	approach	hwosa-shya, I arrive (where the speaker stands)
hwe	recess	hwe-shya, I depart (from where the speaker stands)
nîntha	wrong	nîntha-nœs·en, I spoil (lit. I treat wrongly)
thœ, thœnne	ill doing	(huntsi·) thœnne-zœsten, I have done (evil)
ha	derivation	ha-shya, I come from
·œn	rejection	·œn-tîsno, I have rejected (person. compl.)
thé	exit	thé-nœshya, I go out
ta	ingress	ta-nœshya, I go in
kœ	partial break	kœ-nœshyœz, I broke (in one place)
ya	total breakage	ya-shyœz, do. (in pieces)
tha	relation to water	tha-stil, I threw (plur. com.) into the water
tsœ	" fire	tsœ-dîstil do (do) in the fire
ne	" the soil	ne-nœstla, I put (do) on the ground
na	" " *	na-stil, I threw (do) *to* the ground

Besides the above and other similar affixes, I may refer to those which are instrumental in modifying the form of the verb, and which we shall presently study.

CHAPTER VII.

VARIETIES OF VERBS.

While the whole fabric of the Déné conjugations seems to be the almost exact reproduction of the Latin and Greek verbal inflections, the many forms which modify them, and the nature of these modifications, equally remind the student of the *kal*, *niphal*, *piel*, etc., of the Hebrew grammar. I am well aware that some scholars, among them J. W. Powell in his "Introduction to the study of Indian languages,"† are inclined to assimilate these forms to mere grammatical modes. But I am loath to

*This particle, moreover, refers to a prompt action, having the soil for its terminus.

† Second Edit. p. 53.

follow them, because in Déné these alterations of the verbal structure affect the whole of both the affirmative and the negative conjugations, while some of them, as the potential, alter quite as much, if not more, the body of the verb as their English equivalent, which in all the dictionaries is regarded, not as a modal variation of the verb, but as a quite different word. Thus from the verb *kœnœshyés*, "I break," we obtain, with the help of the potential, *kœsqœs*, "I am breakable." On the other hand, some of these forms consist simply in the change of conjugation, which can hardly be likened to a mode.

The principal forms affecting the verbs, in the Carrier dialect, are the affirmative, negative, usitative, potential, causative, reciprocal, reflective, iterative, initiative, terminative, plural and impersonal. I shall explain, in as few words as possible, the nature of each of them.

Of the affirmative nothing needs be said, since it is the normal state of the verb. Yet it may be well to note that a few verbs, the meaning of which is essentially negative, as *hulœɹ*, "there is not;" *hullil*, "it disappeared," lack the affirmative form, and still are destitute of the elements characteristic of the negative.

The negative can, in Carrier, affect the material structure of the verb in three different ways, viz.: by the incorporation of a negative particle (*l*, *le*, *lœ*, *lî*, *lo*, according to the tense and the letter following these particles); by an inflection of the personal syllable, and oftentimes, though not in every case, by a modification of the mutable part of the desinential radical, *i.e.*, the vowel or final consonant—the initial consonant of a syllable being, as a rule, immutable in Déné. An example will facilitate the intelligence of these remarks. Here are two tenses of the verb *nœs-ʼa*, "I keep in my custody," conjugated under the affirmative and the negative forms.

Present Tense.		Proximate Future.	
Affirmative.	*Negative.*	*Affirmative.*	*Negative.*
nœ-s-ʼa	n-*œlœz*es-*œɹ*	n-œthîs-ʼaſ	n-œſthœzîs-ʼal
n-în-ʼa	n-*œlœz*în-*œɹ*	n-œthan-ʼaſ	n-œſthœzan-ʼal
n-œ-ʼa	n-*œlœs-œɹ*	n-œthî-ʼaſ	n-œſthîs-ʼal
n-œtsœ-ʼa	n-*œl*tsœ*s-œɹ*	n-œz-thî-ʼaſ	n-œſtsœthîs-ʼal
n-œh-ʼa	n-*œlœz*œh-*œɹ*	n-œthîh-ʼaſ	n-œſthœzîh-ʼal
n-œhœ-ʼa	n-*œlœ*hœ*s-œɹ*	n-œhœthî-ʼaſ	n-œſothîs-ʼal
D. n-î-ta	n-*œlœz*î-t*œɹ*	n-œtha-taſ	n-œſthœza-tal

This form is proper to the Western Dénés, and, when under its three

inflections, to the Carriers exclusively. The other Western Dénés eliminate the negative infixes *ſ*, *ſœ*, etc., and if they were to keep the word unchanged by the lexical exigencies of their own dialects they would simply say: *n-œzœs-·œ.ı*, *n-œthœzîs-·aſ*.

The usitative form consists in a modification of the desinential radical bearing sometimes on the vowel and sometimes on the final consonant, or both. Thus *œs·aſ*, "I eat," becomes in the usitative *œs·œſ*, while *œs-chût*, "I take," is transformed into *œs-chœk*. This is the simplest of all the forms, in that sense that it is the only one that never affects any other part of the verb than the desinence. I should also remark, in this connection, that "usitative" is rather inappropriate when applied to the Déné verbs, and is here retained for the sake of conforming to the common wording of American philologists. I think "generalizing" would better answer the purpose.

The potential varies according to the conjugation of the verb it affects. It merely modifies the radical of the verbs of the first conjugation. So, *œ·aſ*, "he eats," changes for the potential its radical *·aſ* into *ṭaſ*, and becomes *œṭaſ*, "it is edible." But if the verb belongs to the second conjugation, the potential transforms it into a verb of the third.

The difference between the affirmative and the causative is equally one of conjugation rather than of form. As a rule, the causative merely changes verbs of the first into verbs of the second conjugation. *Intso*, for instance, means "thou criest," and by giving its pronominal syllable the *ſ* distinctive of the second conjugation, the result is *îltso*, "thou causest to cry." This form, if form we must call it, corresponds to the *hyphil* of the Hebrew verbs. It is not simply a transformation of an intransitive into a transitive verb, as is shown in the following: *naînkas*, "thou sharpenest" (a transitive verb); *naîſkas*, "thou causest to sharpen." In a few cases it has for secondary effect to materially alter the final radical of the verb. Thus *te-nînzœn*, "thou knowest" (a person), when modified by the causative is *te-nîſtzœn*, "thou acquaintest with."

The distinctive elements of the reciprocal form are identical with the particles which, in Northern Carrier, characterize the negative. The difference is only one of place and of results. The reciprocal, unlike the negative, leaves both the pronominal syllable and the desinence unaltered, except when the desinence is immediately preceded by the hiatus, and in a few other cases.

Two prefixes may be assigned as the main distinctive element of the reflective form. They are either *œdœd*, preceding immediately the pro-

nominal crement, or the particle *ʌœ*, prefixed to the modificative syllable *na*. Moreover, *œdœd* has frequently for effect to transform verbs of the second into verbs of the third conjugation. *Tînthî* signifies "thou art valuable," and *tîłthî*, "thou makest him valuable," *i.e.*, thou treatest him with consideration. Hence, *œdœd-îłthî*, "thou makest thyself important," in other words, "thou art proud." In like manner, by prefixing *ʌœ* to *nahwœznœk*, "I narrate," we get *ʌœ-nahwœznœk*, "I narrate about myself," that is to say, "I make my confession." This form is susceptible of a few irregularities.

The particle *na* characterizes the iterative form. It is prefixed to, or inserted in, the body of the verb, according to the composition of the latter. When the verb is formed of several radicals, modificative particles or completive pronouns, its place is generally immediately after the initial root and before any complement or formative syllables. Either the radical or the conjugation of the verb is liable to be thereby modified, verbs of the second conjugation being ordinarily given the pronominal elements of the third, and such desinential roots as *ya*, *yał*, *·aih*, *·ał*, *·as*, *zœn*, etc., being converted respectively into *ta*, *tał*, *ṭaih*, *ṭał*, *ṭas*, *tzœn*, etc. I must remark, in this connection, that such verbs as express an action which, to the Indian mind, is essentially reiterated, take the iterative form, even when in their normal state, as *na-ṡkas*, "I sharpen"; *thé-na-dœs-tli*, "I pray." Divested of the characteristic of iteration, *na-ṡkas* is reduced to *œs-ḳas*, which should be translated, "I sharpen for the first time a new instrument," while *thé-dœs-tli* refers either to a passing supplication, as in a moment of distress, or to the first prayer of the child.

As for the initiative and the terminative forms, they are obtained by the prefixing or infixing of the particle *hwe·* for the former and *ne·* for the latter. These affixes are generally incompatible with the present tense. They have for effect to prefix an *n* to the personal elements of the verbs which lack it while under their regular form, and *hwe·* furthermore changes the pronominal inflection *thîs*, characteristic of the proximate future, into *nthas*, the other persons of that tense being also proportionately altered. So, from *œsten*, "I work," we get for the initiative *hwe·-nœsten*, "I begin to work," and for the terminative *ne·nœsten*, "I have stopped working," while to translate "I will presently commence to work," we will have to say: *hwe·nthastił*, instead of *hwe·-thîstił*. Both forms are, as far as I know, proper to the Carrier dialect.

By plural I mean a certain form whereby a verb is made to refer to an act exercised repeatedly or in connection with several objects, without, however, having the exact signification or the material

structure of the iterative or the objective verbs. Its distinctive element is *nœ*, sometimes inflected into *ne*, which occasionally slightly modifies the desinential radical. So *hwe-dœs-kés* means "I attach" (viz. to a rope hanging down), and demands a singular complement, while *hwe-nœ-dœskœz* has the same signification, but must follow a plural complement. In like manner *œ-ké-skés*, "I write" (lit. indefinite-on-I draw), points to a single sign or cluster of signs as the result of my action. By altering it into *œ-ké-ne-skœz* we obtain a verb likewise signifying "I write," but implying many words or pages as its complement. This form is applicable only to a limited number of verbs.

The last form on our list is the impersonal. It renders the verb impersonal both in structure and in meaning, and yet it cannot be assimilated to the regular impersonal verbs, because it is a mere transient modification of verbs which are of themselves personal. Its use is limited to a few verbs, as *œt-ni*, "he says," which can be transformed into *hwot-ni ; ne-œten*, "he does," into *ne-hwoten ; œtqa*, "he is affected," into *hutqa*, etc., the exact translation of which latter terms is impossible either in English or in French. *Hwotni* is almost the equivalent of "*on dit*," but is still more indefinite in meaning, and I confess my inability to find in either Latin, French or English synonyms of *ne-hwoten* and *hutqa*.

Besides the above modificative forms, there are in Déné what I may call double or composite forms ; that is, a verb is liable to be affected by two or more forms simultaneously. Thus in *te-na-nœs-tzih* (from *te-nœs-zœn*), we have both the iterative and the usitative combined ; while *na-îl-chœk* is simply the verb *œschût* modified by three forms : the iterative (*na*), the potential (*îl*) and the usitative (*chœk*).

All these forms, whether simple or complex, affect the structure of the verb in a transient or accidental manner, none of them—except, of course, the affirmative—being necessary to its existence. Should we now wish to classify the Déné verbs on the basis of the peculiarities of their terminal roots considered as normal desinences, we will find five principal groups of verbal terms, including objective, locomotive and instrumentative verbs, together with verbs of rest, which are in turn divided into verbs of station and verbs of cubation. I beg to be excused from enumerating the well-nigh numberless desinential forms assumable by each of these groups.* I shall confine myself to the following brief remarks :—

*To give an idea of their number, it may suffice to state that each locomotive verb is modifiable by no less than 78 desinential variations, which are in turn multipliable by the number of prefixes successively assumed by the verb.

The signification of the objective verbs is determined by the particles prefixed to their personal or pronominal elements, and the nature of their complement, expressed or implied, by their desinential root. This applies also to the verbs of station.

The radical of the instrumentative verbs denotes the instrument or medium employed to perform the action expressed by the verb, while the prefix points to the manner in which said action has been accomplished.

As for the verbs of locomotion, their final determines the nature of the subject, while the particle preceding the pronominal crement indicates the direction or extent of the locomotion. Materially speaking, verbs belonging to the same group and having the same signification are apt to become, through their desinential modifications, almost unrecognizable. *Niya*, for instance, means "he (human being) walks," and when referring, let us say, to the human mind, it will be altered into *nœdœl-tsœt*, with exactly the same signification.

A verb modified by any of these last terminological inflections may furthermore be affected by any of the several forms which I have described above.

Lastly, considered grammatically and without any reference to their etymology, the Déné verbs may be divided into transitive, intransitive, passive, unipersonal and defective. With the exception of the defective and a few passive verbs, none of these voices have, as such, any fixed characteristic embodied in the conjugation. The passive exists in Déné, but for a limited number of verbs only. It changes a verb of the second into one of the third conjugation. Ex.: *œs·a*, "I order"; *œz·a*, "I am ordered."* Quite as commonly, however, verbs that are passive in English are of the first conjugation in Déné, as *tankœn*, "it is burnt"; *kœnthœk*, "it is broken," etc.

CHAPTER VIII.

MISCELLANEOUS NOTES.

There is hardly any difficulty worth recording in connection with the syntax of the Déné dialects, which is as simple as the machinery of their verbs is complicated. And no wonder: cases and substantival genders, which are ordinarily the occasion of syntactic irregularities, being unknown, it is but natural that the difficulties that spring therefrom be equally wanting.

*Compare the pronominal mutation of this verb with that of its Latin synonym: *jub-eo, œs-·a; jub-eor, œz-·a.*

Phraseological construction might at first appear somewhat puzzling to the student, yet it is as simple as that of our own English. To understand it, we have only to bear in mind that in Déné the governed word, be it direct or indirect complement, always precedes the governing. As a consequence, to translate almost any English sentence, or part of sentence, it is often sufficient to remark the order of priority observed between its component parts, and then dispose the Déné words in exactly the inverse order. The possessive and completive pronouns, being essentially connected with the nouns, are—together with the subjective substantive—alone excepted from this rule. Supposing, therefore, that we have to translate this sentence: I departed only after I had well covered with warm blankets my dear little children. We first read the words backwards, observing to join the possessive pronouns to the nouns they determine: My-children little dear blankets warm well I-had-covered-with after only I-departed. Now it simply remains with us to translate word after word, thus: *S-æzkhéhkhe yaz pækéssi·ne tsæt sæzæl sucho pærauzastæz hukwil·az za hweshya.*

The nature and place in the sentence of the completive pronouns is the only syntactic particular that might be said to offer any real difficulty. Direct completive pronouns are incorporated in the verb, just immediately before the personal element, while the indirect complement is generally prefixed to the initial radical. Ex.: *s-ra-e-nîn-·ai*, "he gave it to me;" *yœ-ra-le-yî-·al*, "he did not give it to him." It will be remarked that these verbs combine in their formative elements—1st, the personal pronoun *(nîn, yî)*; 2nd, the direct completive pronoun *(e, yî)*; 3rd, the indirect completive pronoun *(s, yœ)*, in addition to which we find also incorporated therein: 4th, the negative particle (*le* of the last example)

Another feature of the Déné syntax is that these completive pronouns are never expressed in connection with any but the third person singular or plural, while some verbs never admit of their incorporation into their elements unless they be of the plural number. Thus *œschût*, *dœsni*, etc., may mean either "I took, I told," or "I took it, him or her, I told him or her," according to the context. As a compensation, the direct completive pronouns find place in many a Déné verb, the English equivalent of which is unrelated to any pronominal complement. Thus, for "God made man," we must say, "God man made-him;" "he took his pipe," must be turned, his (own) pipe he-took-it."

These few remarks will, I hope, suffice to give an idea of the Déné syntax. Shall I now say a word about the idiotisms of the language? The task is rather inviting on account of the abundance of the material

to select from. In fact, I might almost say that the Déné dialects are mainly composed of idiotisms, since, in the words of Dr. Trumbull, "it is nearly impossible to find an Indian name or verb which admits of exact translation by an English name or verb."* Among many phraseological peculiarities, we find, in Carrier, such expressions as *shœn yalthœk*, "he speaks a song," that is: he sings an old air with improvised words; *tsiya sœlli*, "it becomes all," for: the supply is exhausted; *upa tzœʌ ·edîsqa*, "I said badly for him," meaning: my words shocked him; *au spa hwe dîni hwuyaʌ*, literally: not for-me thereby thou-sayest there-is (not), which is equivalent to: I do not know what you mean.

Without cultivating rhetoric, some Dénés are genuine orators. To add to the forcibleness of their speech, they generally have recourse to comparisons drawn from their daily surroundings, and from the vegetable and animal worlds. Moreover, their language itself is not deficient in figurative expressions, as the following phrases, which are in common use among the Carriers, will show:—*Pæl sæzîlre*, "sleep kills me," for: I am very sleepy; *netai angran*, "famine murders us," for: we have nothing to eat; *chahwozai hoh-næshya*, "I walk with bare stomach," *i.e.*, I am fasting; *nakôs æsînla*, "the haze of the eyes has made me," that is: I am snow blind; *utzî-sæltsi*, "his heart is acrid," for: he is acrimoniously disposed; *sæʌ-niya*, "he walks alone," meaning: he is a bachelor; *·az sta*, "she stays out," *i.e.*, she has her menses, etc. This last expression is a reminiscence of the custom which among the Carriers forbade the use of the paternal or marital lodge to a female having her monthly flow.†

Some words of their language likewise owe their origin to fiction. Thus they call *na-pe·-tæn-kre*, "packed-back-with," a species of large-flaked snow which falls in the spring, when the migratory birds make their first reappearance, insinuating thereby that it is dropped by them upon their arrival to their summer home.

All of these words and idiotisms are proper to the Carriers. Other dialects of the same linguistic group are equally well stocked with imaged or figurative expressions which are sometimes the equivalents of the above, though more generally they differ therefrom. For, although the various dialects are so closely co-related as to present to the investigator innumerable signs of unmistakable affinity, yet it would be erroneous to imagine that they have individually no distinctive characteristics. The comparative philologist would even find therein grammatical differences which might be of the greatest importance as conducive to

* *Apud* Introd. Study of Lang. 2d. Ed. p. 62.

†See "The Western Dénés," etc., Proc. Can. Inst., October, 1889, p. 162.

the detection of the earliest and purest idiom, and thereby the ethnologist might find his way clear of many difficulties while attempting to trace the origin and describe the migrations of the tribes that speak them. It is not my intention to enter at present upon such a study; still I can hardly close a philological paper, embracing in its scope all the dialects of the group without at least some reference to such grammatical and etymological dissimilarities.

If we must admit as a principle of comparative philology deduced from the formation of the Romance idioms of Southern Europe, that the mutations effected in a language through migrations or conquest are always in the direction of greater simplicity, or, in other words, from inflectiveness to analysis, then I think the dialects of the Western Dénés must be regarded as more primitive, because more synthetic, than those spoken by the tribes whose actual territory extends east of the Rockies. To prove this assertion, it might suffice to point to the rules governing the formation of the negative verbs in the different dialects. In Carrier we have a triple—and often quadruple—negation, consisting of an independent monosyllable and two or three inflections in the body of the verb. These internal variations are reduced to one—sometimes two— in Chiſχohtin, the verb being, as in Carrier, preceded by a negative particle, the co-relative of which is in the Eastern dialects the only particular differentiating the negative from the affirmative. Let us take as an example the verb "I pray." We have in:

	CARRIER.	CHIſχOHTIN.	CHIPPEWAYAN.
Affirm.	the-na-dœs-tli	rèn-tsa-kus-ti	yas-thi
Neg.	*au*-the-na*ſ*-dœ*zæs*-tli (1 2 3)	*tla*-rèn-tsa-ku*zæs*-ti (1 2)	yas-thi *illé* (1)

So the Chippewayans and all Eastern Dénés simply say: I pray not. This is far, indeed, from the doubly—or trebly—inflected negation of the Carriers.

The Eastern Dénés have also lost quite a number of other inflections still existing in the Carrier verbs. Such are, for instance, the dualistic pronominal inflections of the verbs of locomotion, and of the verbs of station corresponding to the three persons of our singular, as well as the two last persons of the indefinite singular of the same verbs. Furthermore, the remarkable synthetism which we have already noticed in the comparative forms of the primary verbal adjectives (*su-ilcho*, *nd œlcho*, etc.), no less than in their six especial differentiating prefixes (*nîn*, *dîn*,

hwo, etc.) ,is totally wanting in most Eastern dialects, which likewise lack such synthetically formed comparative as *œte-no'*, *œte-tiz*, *œte-chu*, etc Time, or some other cause, has also greatly reduced in the Chippewayan, Hare and Loucheux idioms the number of the modificative forms of the objective, locomotive and instrumentative verbs. The ordinal adjectives, which still exist in Carrier, have equally disappeared with the tribes' migrations eastwards. It is also worthy of remark that the Chiſχohtin—a Western dialect—which has many terminological affinities with the Hare (eastern) dialect, has similarly lost those terms. Nor can I find in the Chippewayan, Slave, Hare or Loucheux vocabularies any trace of the Carrier inflected numeral adjectives, *iſowh*, *nauh*, *thauh*, *uaîltoh*, *thaîltoh*, *nahœltoh*, *thahœltoh*, etc., etc.

Now, in the same manner as the admixture of foreign elements in the Latin-speaking populations of the Roman Empire had for effect to gradually disintegrate, and finally replace, by independent particles, the case-endings of the nouns, and the personal inflections of the verbs, even so it must have been with regard to the inflections and synthetical forms which are now wanting in the speech of the Eastern Dénés. On the other hand, since philological researches have taught us that the more synthetical is a language, the stronger are its claims to antiquity, we must conclude from the foregoing that the Carrier is the most ancient, and thereby the purest, of the dialects spoken by the various Déné tribes.

This comparative purity, however, should be understood of its grammatical, or organic, not lexical, features ; for there are not among the Carriers two villages the inhabitants of which speak exactly the same language. Strange to say, these differences bear more especially on the most important part of speech, the verb, its conjugations, and its negative elements. Thus, while a Carrier of Stuart's Lake says : *au ſtœzœz-χwœs*, I do not cough ; a native of Fraser's Lake will say, *au chatœzœ-ſœχwœs*, and a Babine Indian *so· hwatœzœkiſχwœs*.

From so important dissimilarities in the actual speech of homogeneous Indians, whose country is contiguous, one might be tempted to infer that their language is not of a very stable character, inasmuch as that of some Eastern Aborigines is represented as wonderfully changeable.* Yet I hardly think it to be the case. I even believe that it can be safely affirmed that the Déné idioms have not varied more during the last hundred years than either English or French ever did during an equal space of time previous to the sixteenth century.

* Introduct. Study Ind. Lang., 2d Ed., p. 63, text and note.

To enable the reader to judge for himself, and, at the same time, to give him an opportunity of appreciating the latent forces which are acting upon the language of our Indians, I shall lay before him lists of the Carrier words that have undergone any variation during the present century.* They are of two kinds: there are those the vocalic or transmutable elements of which have been corrupted into their present form, and those that have been replaced by entirely new words. To the first class belong the following:—

Old words (100 years ago).	*New words.*
tiſ, crane	teſ
thiſ, berry-basket (bark)	theſ
ſœNn, dog	ſi
œſthœNn, bow	œſthi·
tœne-thœNn, old man	tœne-thî
chœntsœNn, pine *(Pinus resinosa)*	chœntsi
nînlœNn, it flows	nînli
tœtaNn, duck	tœtai
taltaNn, torch	taltai
nzoNn (he is) good	nzu

and their derivatives, together with a few other terms of similar desinence.

That changes in an American language are not restricted to the inflexible syllables of a word will be shown by the following terms, most of which are still understood, even by children, but have grown obsolete:—

Old words.	*New words.*
ul·en, lynx	washi
tsoNntziſ, ice breaker	œté (horn)
ni-yutsé (he barks inland), coyote	chœn-thœ-ſi (wood-dog)
χaih-pa-tsâ, red fox	nankœz tœlkœn
sœs-eɹœſ, brown or cross bear	sœs tœlkœn
ken-tsi, species of red willow	ken tœlkœn

Of these words, the first (*washi*) is evidently a loan word borrowed from the language of the Carriers' neighbors, the Skeena Kitiksons, who

* I base my computation of time upon the age of my informants. One of them, who died two years ago, was close to 100 years old, since he had clear recollection of the advent in this country of the first white men in 1793.

say *wek*, for "lynx." *Tsonutzil* is no more understood, except by elderly people, while *ni-yutsé* is still in use among some Carriers. As for the three last words on our list, they are striking instances of the tendency of a language to resolve its original synthesis into analysis whenever the people that speak it are brought into contact with an alien race. *χaih-pa-tsâ* is a synthetic compound, meaning "he cries for daybreak," and alludes to the nocturnal barking of the red fox. By dint of hearing the French or English name of that animal pronounced by the H. B. Co. traders, the Carriers have imperceptibly dropped their own synthetic vocable to adopt the foreign analytic expression, and they now invariably say *nankœz tœlkœn*, "fox (he is) red." Same remark applies to the two other words.

PHILOLOGICAL CONCLUSIONS.

Let us now recapitulate.

The philologist who has had the patience to peruse attentively the foregoing pages will find, I hope, little difficulty in deducing therefrom the following conclusions :—

1ST.—The Déné languages agree with most American idioms through the polysynthetism which pervades all their composite words, and more especially their verbs.

2ND.—They also resemble the Turanian tongues on account of the monosyllabism of most of their roots, their compounding and agglutinative processes of word-building, the formation of their plural and of their amplificative and diminutive, their law of euphonic sequence of the vowels, their innumerable differentiating distinctions, the fundamental rule of their syntax, which requires that the governed word precede the governing, the postpositive character of their equivalents for our prepositions, the scarcity of their terms expressive of relation or conjunction, etc.

3RD.—We must likewise note the following features which they possess in common with the Semitic languages : the immutableness of their initial consonants as contrasted with their vowels, which are essentially transmutable through the various dialects, the nature of their affix article, the number of the modificative forms of their verbs, and the grammatical duality of such objects as are naturally twofold.

4TH.—Lastly, the pronominal inflections of their verbs, their mode of forming the number "nine," as well as the character of all the interrogative and of some possessive pronouns, are as many traits of affinity with the Aryan languages. Furthermore, we should remember that

5TH.—They have but a limited number of words expressive of abstractness, collectivity or generality.

6TH.—Most of their root nouns are monosyllabic, though some are dissyllabic.

7TH.—The almost totality of their adjectives are regular verbs, and as such they invariably follow the noun they qualify.

8TH.—The possessive pronouns are prefixed to the nouns they determine, and constitute an integral part thereof.

9TH.—The adverbs always precede the verbs.

10TH.—The primary, or main verbal, roots are in every case the last syllable of the verb, the penult being invariably the pronominal or inflectible element, which may be preceded by a secondary radical, the negative particle, the completive—direct, or indirect, or both—pronouns, and the various accessory sense-modifying affixes.

11TH.—The substantive verb "to be" exists in its independent form.

12TH—The divisions of the verbs into transitive, intransitive, passive, etc., are purely theoretical, and have no effect upon the conjugations.

13TH.—There are three conjugations with only one mode and four primary tenses.

14TH.—The negation is, at least, triple in Carrier, double in Chiſzohtin and single in the Eastern dialects.

15TH.—The Carrier is the most synthetical and inflective of all the Western or Eastern dialects.

PELOTECHTHEN BALANOIDES.

By Arthur Harvey, Esq.

(Read 2nd November, 1889.)

In the paper on "Broad Outlines of the Geology of the North of Lake Superior," which I had the pleasure of reading to the Institute last session, I animadverted on the lack of fossils in the archæan rocks. Yet the term Azoic, as an equivalent to Archæan, has always seemed to me too hopeless, and I made a very close examination, during the past summer, of the Animikie formations (Hunt) in the mining district west of Port Arthur, for the purpose of finding traces of life.

There are few things in geology more confused than the nomenclature of these ancient rocks. The name Huronian was proposed by Sir Wm. Logan, long ago, for a series later than the Laurentian, which attains distinctive development to the north of the Great Lake of the Huron Indians. The mind gets bewildered with the *recent* Huronian sub-divisions, such as "Taconic" (Emmons), "Animikie" (Hunt), "Keewatin" (Lawson), "Keeweenaw" (Irving), and I think they ought all to be consigned to oblivion at once—as they will be in the end. The district I examined rests on a red Huronian granite, on which is a green (chloritic) slate, over which is a great thickness of black slate (argillite) with layers of chert or silicious limestone near the junctions; the whole capped in many places by what is locally called trap—a greenstone or gabbro, an eruptive overflow.

Specimens of these rocks are in our museum, and among those presented by myself are some of what our Geological Survey calls "concretionary masses." Possibly, these are alluded to in the Sixteenth Annual Report of the Geol. and Nat. Hist. Survey of Minnesota, p. 317, where, reading of an "argillo-felsitic ground mass" near Ogiskie, Muncie Lake, we learn that "the surface of the rock is studded with spheroidal concretions, which have been cut in section, and have hollow centres, apparently by the solution of the interior portion. They are not pebbles, for they are all very similar, and, besides, reveal, in some cases, concentric lines." In Mr. A. Winchell's report, same volume, p. 239, I find that he describes, on Gunflint Lake, what he had seen elsewhere in the Animikie slate—"surfaces of *laminæ* covered by concave depressions of an ovoid or spherical character, resembling what the elder Hitchcock named *Batrachoides nidificans*. I have discovered that spheroidal concretions between

laminæ sometimes cause such appearance." Mr. Winchell (without a word of remark on this curiously amorphous name) further notes: "Rock 828, cherty concretions, producing *Batrachoides nidificans*."

We may, perhaps, suppose the elder Hitchcock meant depressions which resemble those which are made by nesting frogs. I doubt the connection which Mr. A. Winchell traces between the concretions and the depressions —if the concretions are the same as those of which this paper treats—locally called "cannon-balls," but named by me *Pelotechthen balanoides*—an acorn-shaped thing, grown in or from mud.

The Animikie slates of the Thunder Bay district (Port Arthur) are generally but little inclined from the horizontal bed of deposition. They are often in thin *laminæ*—several to the inch—and, save that they are black, you might imagine them to be deposited in the same way as the clays of Rosedale and other points just north of Toronto. Probably they were sediments in a slowly subsiding sea-bottom, and have altogether perhaps 10,000 feet of thickness in this quarter. I find, wherever you seek for them, examples of the *Pelotechthen*. These do not, according to my observations, occur between *laminæ*, but, on the contrary, there is a clean breaking off of the layers where they touch the *Pelotechthen*, and it breaks away from the strata as a whole—as if there were some shell around it—quite smoothly. Where the miners drift past one you can often see it sticking out of the side of the tunnel.

The uniformity of shape proves these things to be a growth ; they are sometimes round like an orange, oftener ovoid, and they so often have a slight protuberance on the upper side that I compare them rather to an acorn than to an orange or an egg. Their internal structure, too, proves them a growth ; and to illustrate this I have had a small specimen sliced by a lapidary—which I beg leave to add to your museum. You will see that there is a very regular layer of pyrites around the nodule—thickest at about ⅛ of an inch within its outer surface and shading off with a regular decrease towards the centre. This pyritous ring I have never failed to notice, though I have broken dozens of them. Comparing them to an acorn, you might say the layer was between the shell and the meat. I asked one of our members to give the section a proper examination by a petrological microscope, but, owing to the composition of the material (precisely the same argillite as the surrounding strata), nothing additional was learned. I submit that no mere mineral nodule would attain the size of many of these spheroids. I should have thought this growth a *protospongia*, except for the conditions under which it seems to have lived, that is if it be a zoophyte.

1. It grew on the mud in a quiet sea. I do not think sponges grow or ever did grow except on rocks.

2. The formation appears simpler than that of sponges.

Imagine a thing not unlike in shape the puff-balls of our meadows, a lump or a bladder surrounded by an envelope of cellular structure, the whole enclosed in a tough skin, growing in numbers, in the dark mud—without a foot stalk : the mud would at times be deposited in such quantities as to kill the zoophytes—which would account, if nothing else did, for their differences in size : they are from the bigness of a hen's egg to that of a coal scuttle.

The fact that the ring of cellular structure has become filled with pyrites should cause no wonder, nor should the form of the crystals ; the pyrites have replaced the older filling by infiltration—a not unusual process in rocks of such great age. Examples exist of early sponges having had their *spiculæ* replaced by pyrites in much later rocks than these.

The *Pelotechthen* is found throughout the argillites for sixty miles from Thunder Cape to the Silver Mountain, and doubtless further. I have the authority of Mr. Chas. E. Eschweiler that it is not unfrequent among the rocks of the Keeweenaw peninsula—the iron pyrites there being replaced by copper.

OSSIANIC POETRY.

By David Spence, Esq.

(*Read 29th March, 1890.*)

When we speak of Ossianic poetry, it is quite natural to think of the poems published in England in 1762 by James Macpherson, as translations of the poems of Ossian, the publication of which caused such wonder and amazement in the world of letters that they are more or less known to all who take any interest in literature. They were translated almost immediately into all the principal languages of Europe, and admired by the greatest literary characters, by Goethe and Schiller among others. The great Napoleon was in the habit of carrying a copy in his pocket during his military campaigns. In Britain they met with a mixed reception; accepted as genuine, and placed on a level with the great works of antiquity by such eminent critics as Hugh Blair, they were, on the other hand, assailed by Dr. Johnson and others as impudent forgeries. The doctor declared that there was no Gaelic manuscript in the world one hundred years old. The passions and prejudices called into existence by the rising of '45 contributed fuel to the fire of controversy; the voice of calm reason was drowned in the shouts of the combatants. It is generally assumed in our day that the genuineness of the poems of Ossian has been successfully assailed, and that the controversy has been closed with a verdict against Macpherson. This is by no means the case. There are men of equal eminence in Britain and on the Continent of Europe to be found on opposite sides of the question. There is hardly a critic in our day, even among the opponents of Macpherson, who regards him as the sole author of the poems; the question being how far he tampered with and changed the materials which came into his possession. These questions I purpose in the course of this paper to discuss. It is generally taken for granted also that Ossianic poetry is exhausted by the publication of Macpherson's Ossian and the "Seann Dana" of the Rev. Dr. John Smith, of Campbelltown. This also is a mistake. From Sir James McGregor, Dean of Lismore, in 1512, to John F. Campbell in 1872, there were at least twenty-six collectors of Gaelic Ossianic poetry, exclusive of Macpherson and Smith. These twenty-six collected in all 54,169 lines; Macpherson 10,332, and Rev. Mr. Smith 5,335. Macpherson, therefore, collected only one-sixth of the whole. The poetry collected

by the twenty-six differs very much in language and form from that published by Smith and Macpherson, being more of the ballad form, and evidently intended in many cases to be sung and recited on particular occasions, while that of Macpherson especially is of the Epic style. As to the genuineness of these ballads there can be no question ; they may not go back to the third century, but many of them are undoubtedly hundreds of years old.

The Dean of Lismore.

Of the large manuscripts, the oldest is that of the Dean of Lismore, which was written not in the old Gaelic letters, but in the current handwriting of the time. It bears date 1512 ; but it does not appear to have been finished till about the year 1525. It contains in all over eleven thousand lines, of which 2,665 are Ossianic. As it is written phonetically it is extremely difficult to decipher ; but we are indebted to the great industry, patience, and scholarship of the late Rev. Dr. Thomas McLauchlan, of Edinburgh, for the publication of a considerable portion of the text in its original form, with translations into English and into modern Gaelic. Some of these poems seem to be very old, dealing as they do with matters belonging to the fifth and sixth centuries, and nine of them are ascribed to Ossian himself. In my opinion they are, however, far inferior to those published by Smith and Macpherson. The discovery of this volume disposes effectually of the contention of Dr. Johnson in reference to Gaelic manuscripts.

The Seann Dana : Rev. John Smith, D.D.

These were first published in Gaelic in 1787, an English translation having previously appeared. The authenticity of these poems was also assailed, but the doctor's own statement in reference to them seems quite reasonable and in accordance with the facts. He states that the material was written down in fragments from recitation ; that he rejected what was manifestly spurious ; compared the different portions and joined them together, he in some instances furnishing the links. In this short paper it is impossible to deal in detail with all the collectors. I shall accordingly consider only the collections made by Macpherson and by Campbell.

James Macpherson.

James Macpherson, having in 1759 published " Fragments of Ancient Poetry," was prevailed upon by Lord Elibank, Dr. Blair, and others to

undertake a journey to the Highlands in order to gather more Ossianic poems. He, along with the eminent Gaelic scholars, Lachlan and Ewen Macpherson, travelled through the Highlands in 1760 for this purpose. Lachlan took down many poems recited by various persons in the Highlands, and copied some manuscripts. In 1762 Macpherson published what he termed English translations; and at once the great war as to their authenticity began. It is certain that Macpherson collected a great number of poems from recitation, and that he rescued a large number of manuscripts written in the old Gaelic characters, which bore all the marks of antiquity. These documents were seen in his possession by men whose word is above question. In 1796 James Macpherson died, leaving a large amount of money by his will toward the publication of the Gaelic poems from which, as was alleged, the English translation was made. A copy of the poems prepared for the press in his handwriting, or that of his friends, was found among his papers; but not a scrap of the manuscripts, or of the original copies of the poems taken from recitation could be found. He had at one time placed these documents in the hand dsof Becket, a London bookseller, and advertised that any one wishing to satisfy himself might see them there. It must not be forgotten that nearly forty years had elapsed before a search was made for them by the Highland Society. They may have been in the meantime mislaid or lost, or condemned as a nuisance by some tidy housekeeper, and consigned to the flames.

On the death of Macpherson the Highland Society of Scotland began in earnest to gather evidence from every available quarter as to the authenticity of the poems. Their secretary was Henry Mackenzie, the author of "The Man of Feeling." The inquiry was conducted in the most judicious spirit, and their report, published in 1805, embodies the results of the investigation.

It is extremely difficult for those who regard Macpherson as the author to explain away the vast array of facts contained in this Report; and it is to be feared that some of them have unconsciously presented a garbled statement of the evidence. W. F. Skene, one of the greatest authorities on the early history of Scotland, says in his introduction to the book of the Dean of Lismore (1799): "Andrew Gallie, of Badenoch, sent to the Highland Society a part of the Gaelic of Fingal, which appeared in the Gaelic version subsequently published. He said that he had taken it from a manuscript he had received, 'written by a friend, who was at that time with Macpherson and me; a gentleman well known for an uncommon acquaintance with the Gaelic language and a happy faculty for writing it in Roman characters.' On being pressed to say

who that friend was, he says his name was Lachlan Macpherson, of Strathmashie."

Now the evidence of Rev. Andrew Gallie is far stronger than it is represented in the above statement; and he is only one of those who reported to the Highland Society. He and James Macpherson being old friends, the latter, along with Lachlan Macpherson and Captain Morison, remained at his house in Brae-Badenoch on their return from the Highlands, arranging and translating the manuscripts procured, which he said were poems of Ossian.

In a letter (dated 12th March, 1799) to Charles McIntosh, a member of the committee of the Highland Society, he wrote that he remembered perfectly that at the end of some of these volumes was a statement that they had been collected at the end of the 11th century by Paul Mac-Mhuirich; that they thought the writing had been done by an ecclesiastic, for the characters and spelling were most beautiful and correct; that every poem had the first letter of the first word most elegantly flourished and gilded; some were green, some red, some blue, and some yellow; that the material seemed to be limber dark vellum bound in strong parchment, and that Macpherson got them from Macdonald of Clanronald. He said also that they were written in the old Gaelic characters, which he could read, though with difficulty; that he amused himself in reading these poems while Macpherson was busy with his translations, and that they differed at times as to the meaning of certain words in the original. He sends sixteen lines taken from the manuscript, in the original Gaelic with a literal translation, and his statement as a whole is most circumstantial and minute.

The statement of this clergyman is so simple, so ingenuous, and so natural that it is impossible not to believe him. Now, it is to be noted that these very lines appear in Macpherson's "Fingal," with the orthography modernized but otherwise unchanged. The translation given by Mr. Gallie is as follows:—

Man was opposed to man and steel to steel,
Shields sounding, men falling;
Like hammers of hundreds on the son of the embers,
Swords rose and fell.
Gaul went on like a blast descending from the height,
As he destroyed heroes.
Swaran was like a flame of the desert,
That consumes the sounding heath of Gormal.
But how shall I relate in song
The heavy death of spears that was there?
Terrible was the strife of battle,—
High flamed my sword.

Malcolm Macpherson makes a declaration that his brother gave Macpherson a quarto Gaelic manuscript of poems, 1¼ inches thick. Sir Adam Ferguson saw manuscripts stained with smoke in Macpherson's possession. Rev. Dr. Cameron and four other Catholic clergymen make a very important declaration. They say that Rev. John Farquharson, lately prefect of studies in the College of Douay, was, in his youth, a missionary in Strathglass in Invernesshire, that he commenced to collect Gaelic poetry before 1745 ; that he filled a folio volume three inches thick; that all these gentlemen saw it in his possession from 1763 to 1777 ; that Macpherson's translation was sent to him at Douay ; that Mr. McGilvray, one of the declarants, saw it there in 1777, tattered and torn, tossed about by the students who knew nothing of its value, and who tore leaves off it to light their fires. Bishop Cameron thought that it was destroyed when the Revolutionary army carried off the papers of the College.

From all the evidence it is highly probable that Macpherson found manuscripts, of which we know nothing, which he may have changed and modernized in many respects and placed together, supplying the links, as did Rev. Dr. Smith. He may have destroyed the original in his possession for some reason unknown to us. It may also be observed that we have not these poems even as Macpherson left them ; for the Highland Society, in appointing Rev. Thomas Ross to edit them, instructed him to conform the orthography to the system used in the translation of the Scriptures. The longer poems appear to have been made up of shorter ones by Macpherson or some preceding poet. There are portions that seem the creations of some great genius, while other parts are commonplace. The ground work or subject matter of the poems is admitted by the ablest opponents of Macpherson's claims to be extremely ancient, and portions contain legends and myths common to the whole Aryan world. There are poems, such as the "Battle of Gabhra," in some versions called the "Death of Oscar," which have been found current among the most illiterate people in various parts of Scotland. A copy was printed by Gillies in 1786 ; 286 lines were taken down from recitation in the Isle of Skye ; 2 versions are printed in the Dean of Lismore's book ; and a version was found in Ireland and printed by Miss Brooke. This is believed to have been a real battle fought more than thirteen hundred years ago, and it forms the subject matter of a considerable part of Macpherson's "Temora."

JOHN F. CAMPBELL AND HECTOR MCLEAN.

Just one hundred years (1860) after the tour of James Macpherson to the Highlands, John F. Campbell and Hector McLean, both of the Island

of Islay, began to collect Gaelic tales and poems in the Highlands. The work was done in the name of Campbell, a gentleman of good family and of the highest character and culture, and a good Gaelic scholar. His co-worker, Hector McLean, is a man of great ability, a profound critic, and one of the best Celtic scholars in Britain. He had a large share in collecting and translating the tales. A considerable number of men were employed in different parts of Scotland collecting manuscripts and writing poems and tales from oral recitation. The names of the collector and reciter, with notes of time and place are given in every instance.

These men sought particularly for poems like Macpherson's, but although they found many dealing with the same incidents, they could find none of similar language and form. Strange as it may appear, some of these tales were found to be the same in substance as those collected in Germany, India, and even in Northern Africa. Four volumes were published in 1862, giving the Gaelic versions with English translations. A folio volume, closely printed, of 224 pages of Ossianic ballads was published in 1872, under the name of "Leobhar-na-Feine." The poems printed from manuscript are published just as Campbell found them. His opinion as to the controversy seems to be that Macpherson fused some old Gaelic ballads into epics, or that some other great poet, with a profound knowledge of the Highland people and of old ballads, composed these poems between the time of the Dean of Lismore, 1512, and the time of Macpherson ; and that Macpherson found the manuscript, modernized and published it. In his latest criticisms he seems to lean to the opinion that this work of fusion was done by Macpherson himself.

His reasons for not going beyond the time of the Dean of Lismore seem to be based on negative considerations. There might have been manuscripts in existence of which the Dean never heard. There was but little known of the Dean's own manuscript till it was brought into notice by the Ossianic controversy. The Rev. A. Clerk, the latest editor of Ossian, states there are in the Advocates' Library alone upwards of sixty Gaelic MSS. from three to five hundred years old, not to speak of the "Book of Deer," which is of still greater antiquity. How many literary men, even in Scotland, know much about these manuscripts? Hector McLean thinks that Macpherson composed his English Ossian first, and subsequently translated it into Gaelic ; but the weight of authority is against him. He bases his opinion on his discovery of English idioms in Macpherson's Gaelic. Now, it is, of course, possible, that as to the original portions—the "links" or "joints"—the English may have been first composed, and a Gaelic translation afterwards made, but the great body of the

poems which bear the stamp of genius, bears also the mark of their purely Gaelic origin.

AUGUST EBRARD.

There are scholars of great eminence, both in Britain and on the continent of Europe, who still believe in the authenticity of Macpherson's Ossian. The late Rev. A. Clerk, editor and translator of the last edition of Ossian, may be mentioned as representing British scholarship on the side of Macpherson. August Ebrard, an eminent German scholar, who made Celtic a special study, examined the texts of Macpherson minutely in both Gaelic and English, compared the narratives therein with the state of society in the third century (the supposed era of the *Feine*) and found the correspondence so remarkably exact that he was fully convinced that the poems of Ossian are genuine productions of that age. He gives many instances from the poems of beautiful Gaelic sentences changed in the English version into sheer nonsense owing to Macpherson's ignorance of the meaning of the Gaelic texts. He notices among other things that the *Lochlanaich* are always represented as carrying brown shields, while the Gaels bear blue ones, thus corresponding with the fact that the former in that age used bronze while the latter used steel. He points out that the war between Fingal and Swaran has been proved to be a historical fact. Ossian represents Swaran as landing in Ireland with a mighty host. Cuchullin, the guardian and regent of the young King Cormac, gives battle, without waiting for his allies, and is defeated. Fingal arrives by sea with his heroes, renews the war, and defeats Swaran, but provides him with a safe return to his own country. Suhm, the Danish historical investigator, proves in his Danish History that there was a king of West Gothland named Swaran, who, after several piratical voyages, fell into a war with Gram, King of Norway, in the year 240. Suhm places this voyage to Ireland in 238.

Another great German, Ehlert, takes an opposite view, and designates the poems of Ossian "the most magnificent mystification of modern times."

THE SUBJECT MATTER OF THE POEMS.

The Ossianic poetry deals with the mighty deeds of the heroes of the Feine, their generosity, magnanimity, hospitality—heroes who always resisted the proud and powerful, and gave protection to the weak under their swords. Their foes are various, among them "The King of the World," by which name may be designated the Emperor Severus. The Lochlanders were their sturdiest foes, and single combats between their respective kings, and great battles between their respective armies are

described with a force and vigour never excelled in literature. Their victories are always won by personal strength and prowess ; never by great generalship. Strangers are always protected ; even their bitterest enemies, if found without friends in their territories, are unharmed. The prevailing sentiment was :—

> " My foeman's life I never sought
> If he desired to leave in peace."

This scrupulous hospitality is the sentiment that Sir Walter Scott ascribes to Roderick Dhu, when he describes him as protecting Fitzjames till he reaches Coilantogle Ford, and then challenging him to mortal combat. This was the sentiment of the starving peasants of Scotland, who for nine months protected the unfortunate Prince Charles with thirty thousand pounds " blood money " on his head.

These ancient songs lead us into a new and wonderful world : a world without Christianity, without formal religious belief ; where all modern ideas vanish ; a world without cities, or civilization in the modern sense of the word. Iron, steel, and implements of war are found in the country. The poems in many cases are full of genius, and are entirely free from the slightest tinge of immorality. The deaths of the heroes are delineated with the most exquisite tenderness ; their love is pure, disinterested affection, without the faintest taint of coarseness ; and they always afford protection to women, even at the risk of their own lives.

Gibbon, referring to a battle between the Emperor Severus and the Caledonians, supposed to be the subject of one of the Ossianic poems, where " the son of the King of the world," Caracal, fled from the arms of the Caledonian hero "along the fields of his pride" has the following :—

" Something of a doubtful mist still hangs over these Highland traditions ; nor can it be entirely dispelled by the most ingenious researches of modern criticism ; but if we could with safety indulge the pleasing supposition that Fingal lived, and that Ossian sung, the striking contrast of the situation and manners of the contending nations might amuse a philosophic mind. The parallel would be little to the advantage of the more civilized people, if we compared the unrelenting revenge of Severus with the generous clemency of Fingal ; the timid and brutal cruelty of Caracala with the bravery, the tenderness, the elegant genius of Ossian ; the mercenary chiefs, who from motives of fear or interest, served under the imperial standard, with the free-born warriors, who started to arms at the voice of the King of Morven : if, in a word, we contemplated the untutored Caledonians, glowing with the warm virtues of nature, and the degenerate Romans, polluted with the mean vices of wealth and slavery."

The topography of Scotland in almost every district, especially to the north of the Clyde, bears testimony to the prevalence in ancient times of Ossianic ideas. Every man, every woman, and I might say every child in the Highlands, even at the present day, is familiar with the names and deeds of the Fingalian heroes. Perhaps no name has ever been so familiar to Highlanders as the name of "Blind Ossian" (for it is believed that he was blind in his old age). I am told that this is also the case in Ireland, where the name is pronounced with the accent on the last syllable. In 1567, when Bishop Carswell printed the Gaelic prayer book, the first book printed in the Gaelic language, he complained that the people were so much taken up with the tales of the Feine that the clergy could not command their attention. "The Celts," he says, "desire and accustom themselves more to compose, maintain, and cultivate lying worldly stories concerning Finn MacCumhaill and the Feine rather than teach and write the faithful words of God." The clergy, if any, had good reason to denounce the tales in which the people took so much delight; and from which they found it so difficult to turn their attention to the Gospel. For at least five centuries, then, these names have been familiar throughout Scotland. We can see the grand figure of the Ossianic characters receding back into the ages till they were lost in the mists of antiquity, and have, to use the beautiful language of Tasso,

"Vanished to a fable and a sound."

The Book of Leacan contains a poem in very old Irish, which, probably, has come down from some period beyond the eleventh century; and which has been translated as follows :—

Whence the origin of the Gaidhil,
Of high renown in stiff battles?
Whence did the mighty stream of ocean
Waft them to Erin?

What was the land in which they lived?
Lordly men, the Fene;
What brought them for want of land
To the setting sun?

What was the proper name for them
As a nation?
By which they were called in their own land—
Sguitt or Gaidhil?

Why was Fene said to be
A name for them?
And Gaidhil—which is the better?—
Whence was it derived?

In the opinion of this writer the terms Gaidheal, Scot, and Feine were applied to the same people ; but the history of their origin was then as much a mystery as now. The opinion was that they came by sea, but the country whence they came was unknown.

Who then were the Feine? and what is the origin of the name? It has been suggested that it may possibly have some connection with that of the Finns : for the name Oscar is common in the North and is a royal name in Sweden. Or it may, say some, indicate a connection with the Pœni or Phœnicians, who in early times were frequent visitors to the British Isles. An old poem, published by the Ossianic Society of Dublin, on the battle of Gabhra (which there is every reason to believe was a real battle fought over thirteen centuries ago) speaks of " the Feine of Erin, the Feine of Albin, the Feine of Britin and Lochlan," as taking part in the conflict. W. F. Skene quotes this poem to prove that the Feine were a widely-extended nation, spreading even over Lochlan—that is, the country north and east of the Rhine, including Scandinavia. I venture the suggestion that perhaps Skene misunderstood the passage, and that the word was intended to be " fine," which means clan, tribe, or nation. The two words are much alike in sound and spelling, and the one could easily be taken for the other. The passage, therefore, may mean that the " nations " of Erin, Albin, Britin, and Lochlan were represented at that battle. This suggests another question, namely, Did the Gaidheil first speak of themselves as the "*fine*" or nation *par excellence*? If this be so when, in the course of ages, the meaning of the word was lost, the term which was first the common name for any tribe may have become the proper designation of the Gaelic-speaking race. The people of the Highlands never call themselves Scots. They are known among themselves as Gaidheil or Albanaich. The name of Scotland is Albin, and the part of it north of the Forth and Clyde, Gaidhealtachd, which is likely the name which the Romans attempted to pronounce, getting as near it as the word Caledonia.

As a specimen of this poetry allow me in closing this paper to quote a few lines from a translation to be found in the Highland Society's Report (which in this instance at least is certainly not equal to the Gaelic original) in which the poet describes the terrible impetuosity of Diarmid in battle, and his calmness and gentleness after victory ; the lines being also intended as a contrast between his life and death :—

" Thy strength was like the strength of streams in their foam ; thy speed like the Eagle of Atha, darting on the dun, trembling fawn of the desert. In battle thy path was like the rapid fall of a mountain stream, when it pours its white torrent over the rock, and sends abroad the gray

mists on the wings of the winds. The roar of the stream is loud through Mora's rocks. Mountain trees, with all their moss and earth, are swept along between its arms ; but when it reaches the calm sea of the vale its strength is lost, and the noise of its course is silent. It moves not the withered leaf, if the eddying wind doth not aid it. On eddying winds let thy spirit be borne, Son of Duino, to thy fathers, but light let the turf lie over thy beauteous form, and calm in the ground be thy slumbers."

MEMORANDUM ON THE MOVEMENT FOR RECKONING TIME ON A SCIENTIFIC BASIS, BY WHICH THE GREATEST POSSIBLE DEGREE OF SIMPLICITY, ACCURACY, AND UNIFORMITY WILL BE OBTAINABLE IN ALL COUNTRIES THROUGHOUT THE WORLD.

By Sandford Fleming, C.E., C.M.G., LL.D.

(Read 30th November, 1889.)

1. Notwithstanding the great advance which has been made during the present century, in all the Arts and Sciences and their application to the affairs of human life, the reckoning of time is still in a primitive condition in many countries and in an imperfect condition in every country. Difficulties have been developed since the introduction of rapid means of communication, through the twin agencies steam and electricity, which when examined prove that time is computed generally on principles which are untenable. The world's time-reckoning is in fact an exceedingly complicated combination; it is productive of confusion and the confusion is apt to be increased and intensified as population increases and lines of rapid communication are multiplied.

2. During the last ten years efforts have been made to overcome the evils referred to by establishing a remedial system on a sound scientific basis which would be acceptable to all nations and by which perfect accuracy, uniformity, and simplicity would everywhere be obtainable.

3. The subject has been carefully considered by many individuals and by Scientific Societies in Europe and America. It has been discussed at Geographical and Geodetic Congresses at Venice and Rome; and at Conventions of Scientists and practical business men in America. On all these occasions the solution of the problem has been promoted. As an outcome of these various meetings and efforts, the President of the United States, under the authority of an Act of Congress, invited the Governments of all civilized nations to appoint delegates to meet in conference at Washington to consider the whole question and take decisive action in respect thereto.

4. The Washington Conference embraced delegates from twenty-five nations, they had eight sessions, the first was held on 1st October, 1884, the last on 1st November following. After patient deliberation and discussion the object of this International Conference was accomplished by the

passage, with substantial unanimity, of a series of resolutions determining the principles upon which all the nations of the world may unite in the adoption of a universal system of reckoning time.

5. The important results of the Conference are the establishment of (1) a prime meridian for reckoning longitude, (2) a zero for time reckoning, and (3) a unit-measure of time to be common to the whole world.

6. The prime meridian corresponds with the Greenwich meridian.

7. The zero of time may be defined as the moment of mean solar passage on the anti-prime meridian.

8. The unit-measure of time, designated the universal day, may be defined as the interval between two successive mean solar passages on the anti-prime meridian.

9. The Conference determined that the hours of the Universal day shall be counted in a single series from zero to 24.

10. The Universal day, as defined by the Washington Conference, begins and ends at the same moment as the civil day at Greenwich, but it differs from the Greenwich civil day in respect to the numbering of the hours. While the Universal day has a single set of hours numbered from 0 to 24, the Greenwich civil day is divided at noon into halves, the half days before and after noon being subdivided into separate sets of hours, each numbered from 0 to 12 and distinguished as Ante-meridian and Post-meridian. Greenwich time is the local time so-called of the meridian of Greenwich. Universal time, on the other hand, is understood to be common to all localities, and the Universal day is held to be the date of the world.

11. Considerable progress has been made in the adoption of the principles of universal time and the practical success which has attended the application of these principles goes to show that the unification of reckoning by the several civilized nations can best be effected step by step.

RECKONING BY HOUR MERIDIANS.

12. The first important step is the adoption of the "Hour Zone System," commonly designated in America "Standard Time." It may be stated, that in the theory of Universal time the fundamental principle is unity, it is held that there is not more than one time in the whole Universe and that the idea of separate and distinct times in each separate locality is incorrect. While the essential principle of Universal time is indisputable it cannot be denied that a perfectly uniform notation of time throughout the entire globe comes into direct conflict

with our preconceived notions and habits of thought. The Hour Zone system is introduced as an easy means of transition from old to new ideas and it is found that by adopting Hour Meridians as local standards for reckoning, grave difficulties are in a large measure overcome without any violent departure from our inherited usages and prevailing customs. The hour zone system also furnishes the means of applying the correct principles of Universal time in ordinary affairs.

13. In the Hour zone system the circumference of the Globe is divided into twenty-four sections or zones. The central line of each zone is an hour meridian, and the hour meridians are fifteen degrees of longitude apart. The accompanying chart of the world on Mercator's projection shows the geographical position of the twenty-four hour meridians. They are numbered in consecutive order towards the west from zero, the anti-prime meridian.

14. The Hour zones theoretically extend seven and a half degrees of longtitude on each side of the hour meridians, but in practice that is by no means an essential rule. The boundary line of contiguous zones may be governed by national, geographical, or commercial circumstances.

15. As the earth rotates on its axis in twenty-four hours an hour elapses between the solar passage on each successive hour meridian, it is obvious therefore that if the reckoning in each zone be governed by its respective meridian, the reckonings everywhere will be directly related. There will be differences but the differences will in every case be known and they will invariably be multiples of an hour. Throughout the Globe there will be complete identity in the minutes and seconds. For example when the reckoning in the tenth zone is six hours twenty-five minutes, in the eleventh zone it will be five hours twenty-five minutes, in the twelfth zone four hours twenty five minutes, and so on, each successive zone differing by an exact hour. Thus the only departure from complete uniformity in reckoning around the Globe will be in the numbers of the hours, but the numbers of the hours being governed by the numbers of the hour meridians, the passage to Universal time is simple and direct.

16. As the reckoning in the zone of the twelfth hour meridian corresponds with Universal time, the reckonings in all zones to the East of that meridian will be one or more full hours in advance of Universal time, and in all zones to the West of the twelfth hour meridian the reckonings will be behind Universal time. Universal time will be the mean of all possible reckonings under the hour zone system, and the Universal day the mean of all possible local days.

17. The hour zone system has been adopted for ordinary use in portions of the three Continents of Asia, Europe, and America. In 1887 an Imperial Ordinance was promulgated directing that on and after the first day of January in the year following, time throughout the Japanese Empire would be reckoned by the third hour meridian. The reckoning in England and Scotland is by the twelfth hour meridian, in Sweden the eleventh hour meridian is the standard, and quite recently it has been resolved in Austria-Hungary to be governed by the same meridian. Efforts are now being made to follow the same course in Germany and in other European countries. In North America the hour zone system has been in general use for six years. The reckoning of time being governed as follows, namely :—

By the 16th hour meridian in Nova Scotia and Prince Edward Island.

By the 17th hour meridian in New Brunswick, Quebec, Ontario, Maine, Vermont, Massachusetts, New Hampshire, Connecticut, New York, Pennsylvania, Rhode Island, New Jersey, Maryland, Virginia, North and South Carolina, Georgia, Florida.

By the 18th hour meridian in Manitoba, Keewatin, Minnesota, Wisconsin, Michigan, Iowa, Ohio, Illinois, Indiana, Kentucky, Missouri, Arkansas, Tennessee, Alabama, Mississippi, Louisiana.

By the 19th hour meridian in Assiniboia, Saskatchewan, Alberta, Athabasca, Montana, Dakota, Wyoming, Nebraska, Colorado, Kansas, New Mexico, Texas, Utah, Arizona.

By the 20th hour meridian in British Columbia, Washington, Idaho, Oregon, Nevada, California.

18. The adoption of the hour zone system has been the means of removing the chaos of local times which in many quarters previously caused much friction. Wherever the reckoning is governed by the same standard meridian there is complete uniformity in every division of time. In Japan, Central Europe, Great Britain, United States, Canada, and Mexico, identity of reckoning prevails. In all these countries the hours are struck at the same moment, the only difference is in the numbers by which they are locally known ; with that single exception every division of the day is simultaneous.

THE 24 HOUR NOTATION.

19. The second important step in regulating the reckoning of time throughout the world, is to abandon the division of the day into ante-meridian and post-meridian hours, separately numbered, and to substi-

tute a single series of hours numbered from 0 to 24. This change was resolved upon by the Washington Conference with respect to the Universal day.

20. The old practice of dividing the day into separate sets of twelve hours, however it arose, has not only no advantage to recommend it, but the usage has been found to have positive disadvantages, which have been brought into prominence within the past generation. The division of the day into halves, doubles the chance of error and tends to confusion in connection with the running of railway trains. The mis-print or mistake of a single letter, A.M. for P.M. or *vice versa* will easily arise to cause inconvenience, loss of time, possibly loss of property, or loss of life.

21. The 24 hour notation, so called, removes all doubt and uncertainty and promotes safety. Where it has been adopted in Canada there is no ambiguity, moreover the change has been effected without difficulty and without danger. The hours having a lower number than twelve are known to belong absolutely to the first part of the day, and those having a higher number to the afternoon and evening.

22. The 24 hour notation is strongly recommended by prominent men in Russia, Germany, Italy, Austria, Belgium, France, Spain, Great Britain, indeed, it may be said in every country in Europe. It is brought into daily use on the great lines of telegraph leading from England to Egypt, India, China, Australia, and South Africa. It is received with very great favour in America. It has been in use for nearly four years on 2354 miles of the Canadian Pacific Railway, and for nearly three years on the Canadian Government Railway, the Intercolonial, 986 miles in length. The Managers of these railways and all the employees speak of the 24 hour notation in the highest terms. It is the only system in use at this date north of the 49th parallel and west of the 89th meridian. There is not a Province in Canada where it is not already in use. It has been adopted on the railways in Nova Scotia, New Brunswick, Prince Edward Island, Manitoba, Assiniboia, Alberta, British Columbia, and partly in Quebec and Ontario ; so satisfactory are the results of the new notation that it has been determined to extend its application, and it is expected that before long it will be in general use for railway purposes throughout the Dominion.

23. In the United States a strong expression of opinion in favour of the 24 hour notation has been obtained. The American Society of Civil Engineers, deeply concerned in the perfection of the railway system of the Republic, has, since the year 1880, taken an active interest in time reform. This Society led the way in preparing the minds of men for the general acceptance of the Hour Zone system six years ago, and since then it has

vigorously directed attention to the 24 hour notation. It has a special Committee, whose duty under the authority of the Society is to correspond with Railway Managers on the subject, and in every proper way to promote the adoption of the new notation. The communications which have been sent out by the American Society of Civil Engineers to the leading railway men throughout the country have elicited a very large number of replies. They embrace the opinion of, it is believed, a considerable majority of the managers of all the Railway Companies in North America, and of all who have been heard from about 97 per cent. are in favour of the adoption of the 24 hour notation in the railway service of the country at an early date. It is quite obvious that there is a widespread feeling in favour of the change, and it only remains for the General Time Convention, an organized body representing all the railways in the United States, to take decisive action in the matter, so that the new notation may be brought into use simultaneously in every section of the country.

24. Canada, in adopting the hour zone system and in introducing the 24 hour notation, has undoubtedly taken the lead in carrying into effect, in the most practical manner possible, the essential principles of Universal time. The 24 hour notation has likewise been introduced in the Railway service of China, and it is not a little remarkable that one of the oldest Eastern civilizations conjointly with the youngest Western civilization should set an example in breaking through the trammels of custom to inaugurate a reform which every intelligent person believes to be desirable. Universal time will be substantially adopted in North America so soon as the 24 hour notation is brought into use throughout the United States. There is but one step necessary to secure to Great Britain all the advantages of Universal time, that is the adoption of the 24 hour notation ; this one reform concerns the railway system and railway travellers especially, and in a country where all travel more or less, I cannot but think that if English Railway Managers were informed as to the ease with which the change has been introduced in Canada and the satisfactory results which have followed, they would very speedily take means to obtain similar advantages. I am confirmed in this view by an examination of the letters which have been received by the Science and Art Department, South Kensington, copies of which I have been favoured with. These letters go to show that the resolutions of the Washington Conference on this subject are cordially favoured by the following important bodies and Departments, viz :

1. Royal Astronomical Society.
2. The Royal Society.
3. The Board of Trade.

4. The General Post Office.
5. The Eastern Telegraph Company.
6. The Eastern Extension Telegraph Company.
7. The Eastern and South African Telegraph Company.
8. The Society of Telegraph Engineers.
9. The Trinity House.
10. The India Office.
11. The Colonial Office.
12. The Admiralty.

To these may be added the Committee of Council on Education, and the Board of Visitors of the Royal Observatory, Greenwich. Indeed, I cannot learn that a single objection has been received from any quarter.

25. As the fundamental objects of the Washington Conference were to remove all doubt and ambiguity in time-reckoning, to prevent discrepancies, to secure simplicity and introduce uniformity, it is manifestly important that the changes proposed, supported as they were at the Conference by the representatives of twenty-five nations, and subsequently looked upon in so many quarters as in themselves intrinsically desirable, should without unnecessary delay be accepted, and, as far as practicable, put in force generally. The first important step is the selection of hour meridians and the adoption of the hour zone system. With these objects in view, the accompanying map has been prepared, it shows the position of the 24 hour meridians and indicates, in a general way, the country or section of country to which any particular hour meridian has greatest proximity. It would greatly advance the unification of time throughout the world, and greatly promote the common good of mankind if every nation with all convenient speed would take means to select the hour meridians on which its reckoning of time may be based. Appended hereto will be found a table indicating the hour meridians, which, in each case, may be found eligible for selection, but in a matter of this kind each nation must judge for itself.

26. I have mentioned what has been done in America, more especially in Canada, in furtherance of this movement. If means be taken to extend the use of the hour zone system to all the British possessions around the Globe they will, individually and collectively, participate in the advantages of a common reckoning of time. I venture to submit, suggestively, the appended list of the principal British Colonies and Dependencies with the hour meridians which appear the most suitable for standards in each case.

BRITISH POSSESSIONS.

Table indicating the Hour Meridians, numbered as on the accompanying Map, which may be selected as local Standards for reckoning time in each of the several British Possessions.

The last column gives the differences between local reckonings and the time of the world—Universal Time. The sign PLUS indicates that local reckonings are in advance of, and MINUS that they are behind, World Time in each case.

COUNTRIES.	Hour Meridians.		Hour Zone Reckonings faster or slower than World Time.
	East or West of Greenwich	Numbered on Map.	
The British Islands (comprising)—			
England and Wales - - -	0	12	0 Hours.
Scotland - - - - - -	0	12	0 "
Ireland - - - - - -	0	12	0 "
Canada (comprising) —			
Nova Scotia - - - -	60 West	16	— 4 "
New Brunswick - - - -	75 West	17	— 5 "
Prince Edward Island - - -	60 West	16	— 4 "
Quebec - - - - - -	75 West	17	— 5 "
Ontario - - - - - -	75 West	17	— 5 "
Manitoba - - - - - -	90 West	18	— 6 "
Assiniboia - - - - - -	105 West	19	— 7 "
Saskatchewan - - - -	105 West	19	— 7 "
Alberta - - - - - -	120 West	20	— 8 "
Athabasca - - - - - -	120 West	20	— 8 "
British Columbia - - - -	120 West	20	— 8 "
Australasia (comprising)—			
New South Wales - - -	150 East	2	+10 "
Victoria - - - - - -	150 East	2	+10 "
Queensland - - - - -	150 East	2	+10 "
Tasmania - - - - - -	150 East	2	+10 "
South Australia - - - -	135 East	3	+ 9 "
Western Australia - - -	120 East	4	+ 8 "
New Zealand - - - -	165 East	1	+11 "
Fiji - - - - - - -	165 East	1	+11 "
New Guinea - - - -	150 East	2	+10 "
Possessions in Asia (comprising)—			
India - - - - - - -	75 East	7	+ 5 "
Burmah - - - - - -	90 East	6	+ 6 "

BRITISH POSSESSIONS.—*(Continued.)*

COUNTRIES.	Hour Meridians. East or West of Greenwich.	Hour Meridians. Numbered on Map.	Hour Zone Reckonings faster or slower than World Time.
Ceylon	75 East	7	+ 5 Hours.
Hong Kong	120 East	4	+ 8 "
Straits Settlements	105 East	5	+ 7 "
Labuan	120 East	4	+ 8 "
West India (comprising)—			
Jamaica	75 West	17	— 5 "
Turks Island	75 West	17	— 5 "
British Guiana	60 West	16	— 4 "
Bahamas	75 West	17	— 5 "
Trinidad	60 West	16	— 4 "
Barbadoes	60 West	16	— 4 "
Granada	60 West	16	— 4 "
British Honduras	90 West	18	— 6 "
St. Vincent	60 West	16	— 4 "
St. Lucia	60 West	16	— 4 "
Tobago	60 West	16	— 4 "
Antigua	60 West	16	— 4 "
Montserrat	60 West	16	— 4 "
St. Christopher	60 West	16	— 4 "
Virgin Islands	60 West	16	— 4 "
Dominica	60 West	16	— 4 "
Possessions in Africa (comprising)—			
Cape of Good Hope	30 East	10	+ 2 "
Bechuanaland	30 East	10	+ 2 "
Basutoland	30 East	10	+ 2 "
Natal	30 East	10	+ 2 "
Sierra Leone	15 West	13	— 1 "
Gambia	15 West	13	— 1 "
Gold Coast	0	12	0 "
Lagos	0	12	0 "
Miscellaneous (comprising)—			
St. Helena	0	12	0 "
Gibraltar	0	12	0 "
Malta	15 East	11	+ 1 "
Cyprus	30 East	10	+ 2 "
Bermuda	60 West	16	— 4 "
Falkland Islands	60 West	16	— 4 "
Heligoland	15 East	11	+ 1 "
Aden	45 East	9	+ 3 "
Ascension	15 West	13	— 1 "
Fanning Island	150 West	22	—10 "
Mauritius	60 East	8	+ 4 "
Newfoundland	60 West	16	— 4 "

FOREIGN COUNTRIES.

Table showing the Hour Meridians numbered as on the accompany-map and conveniently situated for reckoning time under the Hour Zone system.

The last column gives the differences between local reckonings and the Time of the World—Universal Time.

The sign PLUS indicates that local reckonings are in advance of, and MINUS that they are behind, World Time in each case.

COUNTRIES,	Hour Meridians.		Hour Zone Reckonings faster or slower than World Time.
	East or West of Greenwich.	Numbered on New Map.	
Argentine Republic	60 West	16	— 4 Hours
Austria Hungary	15 East	11	+ 1 "
Belgium	0 —	12	0 "
Bolivia	60 West	16	— 4 "
Brazil	45 West	15	— 3 "
"	60 West	16	— 4 "
Bulgaria	30 East	10	+ 2 "
Costa Rica	90 West	18	— 6 "
Chili	75 West	17	— 5 "
China	120 East	4	+ 8 "
"	105 East	5	+ 7 "
Columbia	75 West	17	— 5 "
Congo	15 East	11	+ 1 "
Denmark	15 East	11	+ 1 "
St. Domingo	75 West	17	— 5 "
Egypt	30 East	10	+ 2 "
France	0 —	12	0 "
Germany	15 East	11	+ 1 "
Greece	30 East	10	+ 2 "
Hawaii	150 West	22	—10 "
Honduras	90 West	18	— 6 "
Hayti	75 West	17	— 5 "
Italy	15 East	11	+ 1 "
Japan	135 East	3	+ 9 "
Mexico	105 West	19	— 7 "
Netherlands	0 —	12	0 "
Nicaragua	90 West	18	— 6 "
Norway	15 East	11	+ 1 "

THE WORLD ON MERCATOR'S PROJECTION, SHEWING THE 24 HOUR MERIDIANS FOR REGULATING STANDARD TIME.

FOREIGN COUNTRIES.—*(Continued.)*

COUNTRIES.	Hour Meridians. East or West of Greenwich.	Hour Meridians. Numbered on Map.	Hour Zone Reckonings faster or slower than World Time.
Paraguay	60 West	16	— 4 "
Persia	60 East	8	+ 4 "
Peru	75 West	17	— 5 "
Roumania	30 East	10	+ 2 "
Siam	105 East	5	+ 7 "
Servia	30 East	10	+ 2 "
Spain	0 —	12	0 "
Sweden	15 East	11	+ 1 "
Switzerland	15 East	11	+ 1 "
Turkey	30 East	10	+ 2 "
Russia in Europe	45 East	9	+ 3 "
"	30 East	10	+ 2 "
Russia in Asia	165 East	1	+11 "
"	150 East	2	+10 "
"	135 East	3	+ 9 "
"	120 East	4	+ 8 "
"	105 East	5	+ 7 "
"	90 East	6	+ 6 "
"	75 East	7	+ 5 "
"	60 East	8	+ 4 "
Uruguay	60 West	16	— 4 "
United States	75 West	17	— 5 "
"	90 West	18	— 6 "
"	105 West	19	— 7 "
"	120 West	20	— 8 "
Alaska	135 West	21	— 9 "
"	150 West	22	—10 "
Venezuela	60 West	16	— 4 "

NOTE.

Respecting the Hour Meridians as Numbered on the Map.

It is obviously desirable that the hour meridians or sub-standards for reckoning time by all nations should be designated in a manner to render them easily distinguishable and readily known throughout the world. A nomenclature based on geographical terms or derived from local names, however appropriate in one country, may in another, or in an opposite hemisphere be quite inapplicable. Moreover, not only

would differences of opinion arise as to the appropriateness of such terms, but owing to the diversity of languages among the nations, the difficulty of selecting names universally acceptable would be so increased as to render a common agreement respecting them scarcely attainable.

These objections do not apply to numbers. A nomenclature based on numbers would be common to all nations, and each term would have the same precise meaning in all languages and in both hemispheres. The numbers given to the hour meridians as shown on the map, begin at zero and follow the sun in its apparent motion. The solar passage on the anti-prime meridian being the zero of the "universal" or "world" day, at the end of the first hour the solar passage would be on the first hour meridian, at the end of the second hour it would be on the second hour meridian, and so on for each of the twenty-four hours; the hour in each case agreeing with the number of the hour meridian at the instant of mean solar passage. Then it will be evident that with the hour meridians so numbered the solar passage would be the perpetual index of "world" time.

The notation of time in the zone of the twelfth hour meridian will correspond with the numbers of the hours of the "world's" standard, in all other zones it will differ according to a fixed rule. In zones to the east of the twelfth hour meridian, the notation will be in advance, in zones to the west it will be behind; the following formula gives the number of hours which it will be *faster* or *slower* than the world's standard in each case.

Let H be the number of the hour meridian: then

(1) When H is less than 12, the clocks in (H) zone will be faster than the world's standard=12—H.

(2) When H is greater than 12, the clocks in (H) zone will be slower than the world's standard=H—12.

The world's standard will be the mean of the notation in all zones.

The principle of this simple means of distinguishing the twenty-four hour meridians constituting the sub-standards for regulating the reckoning of time the world over, and the advantages to accrue from its universal acceptance and application are further explained in the Smithsonian Report for 1886, pages 351-2.

THE FORMATION OF TORONTO ISLAND.

By L. J. Clark, Esq.

(Read 26th April, 1890.)

My attention has been somewhat abnormally directed towards the lake, and to lake surroundings, and lake currents during the last two or three years, and, in the course of my investigations, I became aware that there were different theories, particularly as regards lake currents and Island formation. Without very much external aid on the subject, but by a careful process of deductive reasoning, I formed a theory, which, like all young theorists, I considered quite unassailable, and which I still view in the same light, but, alas, my theory is not new.

I have found, since making a more critical study of the subject, that it received a very large share of attention nearly half a century ago, by men who have made a name and fame for themselves, not only in Canada, but in other lands as well, in connection with questions of world-wide interest, in one instance at least, and who are still alive and in a position to compare their past theory of what the future of the Island would be with what it really is. I refer to such men as Mr. Sandford Fleming, Mr. Kivas Tully, Mr. Henry Yule Hind, and Mr. Hugh Richardson.*

I find there is quite a wealth of literature on the subject, which I have read with great interest, and which in the main agrees as to the source whence the material, forming the Island, is derived. I have also placed under contribution that never failing source of information, "the oldest inhabitant," and I now place before you the united results of my cogitations on the subject.

At the outset, I will call attention to two theories that have been put forward, but which on examination, I think, will be found insufficient for the purpose. The *first* is that the Niagara River has been a factor in the Island formation in this way. It is said that the direction of the river at its mouth is in a line with Scarboro' Heights, that the great volume of water makes straight across the lake, strikes the north shore, deflects to the west, and carries along the material from the Heights, of which the Island is formed. I heard a gentleman say that this was the

* Mr. Richardson is dead.

producing cause, and that the portion of the Island around where the lighthouse stands was the first to make its appearance.

To disprove this theory, it is only necessary to say that the velocity of the waters of the Niagara River at its mouth is not sufficient to transport the weighty materials of which the greater part of the Island is formed. To move the heavy shale, which forms a considerable part of the Island, would require a velocity of from five to eight feet per second. So that, if it lost none of its velocity in crossing it would not be able for the work. But that is in the region of the unthinkable. It is pretty well established that the temperature of the water of the Niagara River is raised one or more degrees, by the concussion of the Falls and the rough treatment it receives in coming through the rapids. It would, consequently, be lighter than the water of Lake Ontario, and would spread out, to a certain extent, over the surface, and thus, through increased friction, lose a part of its velocity. This has been well established by the fact that after great freshets that have been sufficient to give turbidity to the water of the river, it has been noticed that five miles out from the shore the discolored water has extended five miles to the east and west. By the time it would get across it would be a mere attenuated film on the surface of the lake, weak in its current and subject to the influence of every "breeze that blows." So that we may hardly look for it to gather up its dissipated energies for the herculean task of building up the Island. But the very fact that the Niagara River deposits its detritus in a bar near its own mouth ought to be sufficient evidence that it will not have strength to load up again when it gets across to this side. Mr. Fleming says "such a theory is wild and incapable of defence, though some are bold enough to venture it."

The other theory is that the material has been brought down by the Don, Humber and other streams to the west. But this theory fails as far as the Humber and Mimico Rivers are concerned, inasmuch as there is a depth of 90 feet of water between the outlet of the Bay and the Lighthouse Point, across which it would be impossible to transport the material of the Island withont leaving some traces on its route.

And if the Humber has excavated its huge channel for 30 miles or more in length, and from ¼ to ½ a mile in width, and from 100 to 200 feet in depth, without contributing directly to the formation of the Island, we may naturally suppose the same of the Don.

I say directly, because I believe these streams have contributed to the stratum of clay that underlies the Island and extends out to an unknown distance into the lake.

In this connection, it is interesting to investigate the history of these streams. And, in order to do so, it will be necessary for us to go back to a period anterior to the subsidence of the waters to their present level. All indications point to an ancient lake beach at the foot of the cliff or terrace, which is situated just north of the present limits of Toronto, and which runs parallel with the shore at a distance ranging from nothing at Scarboro' Heights to two or three or more miles in other places. The evidence is pretty strong that the water remained at this level for a somewhat lengthened period. And here I must call attention to a differenee of opinion entertained by our two previously mentioned friends, Mr. Fleming and Mr. Hind. Mr. Hind interprets Mr. Fleming to say, that at the time of the subsidence of the water to its present level the Don began to exist. Mr. Hind takes exception to that view, and I think correctly. For we cannot imagine the large section of land, forming nearly the whole of this Province as at present, without any water-courses. But, on the contrary, the first acre that appeared above the surface of the water would have its miniature streams, and, as the continent gradually emerged from the water, these channels would become longer and broader and deeper. And I believe that when the lake stood at its former level, the Don, Humber and other streams existed pretty much as they do now, the only difference being that their mouths were situated at the then existing shore-line. Remember, I do not say that Mr. Fleming says what Mr. Hind says he does.

Now, we can easily discover what became of the immense amount of detritus brought down by those streams. It formed the present site of Toronto, and the stratum of clay that extends out under the Island and to an indefinite distance beyond. The sandy portions we find deposited first near the ancient beach and the clay farther removed, and as we would naturally expect, the Humber being the mightier of the two rivers, the greater was the amount of material brought down, and the more would the bed of the lake be filled up, so we find the land higher in proximity to the Humber, and the descent is from the west to the east. This accounts for the numerous ravines that were washed out in the present site of Toronto after the subsidence of the water, all having a general direction from N.W. to S.E. One word more as to what caused the subsidence of the water to its present level. The writers I have previously referred to, do not throw much light on that part of the subject but, fortunately the President of the American Association for the Advancement of Science, in a lecture delivered in this city last year, showed very conclusively that it was owing to the melting away of an immense glacier or ice-field that extended along our northern shore and cut off the exit of the water by the St. Lawrence. Previous to that time,

it is supposed the water of the great chain of lakes found its way to the sea by an outlet in a south-easterly direction, through Rome—this is not the one we hear so much about in politics—and Utica, and down the Hudson River. When this great barrier melted away, the outlet took its present course, and the lake assumed its present level.

On the subsidence of the lake to its present level, all the Don and other streams had to do was to excavate from their former terminus to the new shore line. And I would call the attention of my hearers to the much more ancient appearance of the banks of the Don, for instance, in what I may style the old part than the new. This may be very well seen on some of the C.P.R. bridges that happen to be near or at the terrace.

Now, having told you how the Island was *not* formed, I shall endeavor to tell you briefly how it *was* formed ; and, in doing so, I shall keep very close to Mr. Fleming's exposition of the case. The other writers referred to all give Mr. Fleming the credit for first enunciating the true solution of the problem. And I cannot do better than call your attention to a copy of some of the maps and drawings that he has used to explain his theory.

The limited time at my disposal will only allow me to make brief reference to the salient features of the probable solution.

First, the material of which the Island is formed came originally from the Scarboro' Heights ;

Second, the mechanical force which transported the material to its present resting place was the storm action of the waves, which is now as active as ever.

In proof of the first premise we find the material on all parts of the Island to be identical in its nature with that composing the Heights: Prof. Pike informed me that he had made an examination of the material from both places and he found them to be of the same geological formation. Then its continuous connection, until recently, with those cliffs to the east, is also evidence to the same effect.

In proof of the second premise, we have the well authenticated fact of the gradual extension of the Island to the westward. Mr. Hind points out that previous to his time it was ascertained that thirty acres had been added to Lighthouse Point from the time of the first surveys. I was credibly informed, a few days since, by an old citizen that he remembered when the Lighthouse was close to the beach.

Wave action on a beach is tolerably well understood. When the direction of the wave or wind is perpendicular to the beach the effect is entirely

destructive. The waters, in their agitation, become loaded with sand and other material, which it bears away as the waves recede, and which it deposits at various distances from the shore according to its fineness or coarseness. Some of it will be carried out to such deep water as to be beyond the influence of the waves to bring it back again. This is entirely destructive. But when the waves inpinge on the beach at an angle it causes an onward movement of the material of the beach. This is clearly shown in Figures I. and II. The particles held in suspension are thrown up the incline in the direction of the wave, and when the force is spent it moves back towards the water-line in the most direct course, that is perpendicular. The lighter parts will be carried higher and moved to a greater distance forward as shown in Figure II. Thus we find the fine sand away to westward, while the heavier portions remain along the bar in front of Ashbridge's Bay.

During violent storms, astonishing changes take place in the beach. A summer sojourner at Balmy Beach informed me that, during the great storm of 1885 or 1886, when the Lake Shore Road, near the Humber, was washed away, the whole of the beach from the Heights to the head of Ashbridge's Bay, with the exception of a few hundred feet in front of his own place, was washed away. The same gentleman informed me that large boulders, sometimes weighing hundreds of pounds made their appearance after storms and became permanent landmarks, unless taken by the pleasure-seekers of the locality to form rockeries to adorn their front yards.

This shows the great transporting power of water when in motion. But proof of that need hardly be cited at this day when some of the greatest disasters to life the world has ever known, have been attributable to the uncontrolled fury of water when broken loose from its bounds, as, for instance, the Johnstown disaster.

Mr. Sandford Fleming supposed that when the last subsidence of water took place, instead of there being an abrupt cliff at Scarboro', as at present, the land fell off in easy slopes to the water's edge, as shown in Figures III. and IV. Then, owing to the long reach of 180 miles of lake to the east, the immense waves raised by the easterly winds began to produce their abrading effects on said promontory, and the abraded material was carried and deposited to the west, forming a spur, as in Figure V. The same action continuing produced results as shown in Figures VI., VII., and VIII., until we have our present harbor.

Mr. Hind takes objection slightly to Mr. Fleming's view of the promontory extending such a distance into the lake. He bases his objection

on the fact that the depth of water at about one mile from shore is 48 feet,—I verified this fact myself last summer, so that there has been little change in 40 years,—and this he considers to be below the depth at which wave action would be felt, or produce much effect. And this seems reasonable, for at a distance of about 2000 feet from shore we meet with a ridge, the top of which is only about 26 feet below the surface, although on either side it quickly falls away to 33 feet. Now, if the waves had much of an erosive effect at over 26 feet in depth, it would probably remove the top of this ridge, but I found it there last summer just where Mr. Rust found it several years ago when taking soundings of that part of the lake.

But, on the other hand, it occurs to me that if the cliff had formerly extended only a few hundred or even a thousand feet farther south than at present, the bar which now encloses Ashbridge's Bay, would have been driven right on the mainland and have formed a beach, as there appears to have been no stream there sufficient to head it off, as the Don might be capable of doing when it got further west. However, this is not a point of vital importance to the existence of the Island.

It may be claimed that storms from the west would have a counteracting influence. Of course they would, but only in the ratio of 40 : 180, other things being equal. And this, no doubt, accounts for the somewhat peculiar coast-line on the city side of the Island. High and low lake level periods, which have been known to recur at irregular intervals, also had something to do with the irregularity of the said coast-line. According to the American Engineer's Report, between the years 1825 and 1838, Lake Ontario rose nearly 7 feet and Lake Erie nearly the same, which would change the appearance of the Island very much. But it is not necessary to pursue that phase of the subject further.

The phenomena of travelling beaches and deposits, similar to the one under consideration, are by no means rare. One, on a small scale, that came under my own observation, and with which many of you may be familiar, occurs near Grimsby, at what is called the lily pond. The cliffs to the east consist of drift clay containing small fragmentary portions of rock entirely unwater-worn. As the cliff becomes undermined, portions break loose and fall into the water. The clayey portions become dissolved, and are carried out to be deposited on the lake bottom, while the fragmentary rocks become water-worn, and are driven westward where they have formed a ridge six or eight feet in height and fifty feet in width across the mouth of the pond, leaving the opening at the very western side.

Another place I visited last summer, viz.: Irondequoit Bay, near Rochester, presents a similar feature. Mr. Hind calls attention to it in 1854. He says that the opening was then ¼ of a mile farther west than it was formerly, and was becoming shallower.

The mouth of the Aux Sables, in Lake Huron, presents a remarkable illustration of the onward progress of a beach in the direction of the prevailing winds.

Rondeau Harbor, in Lake Erie, is almost a fac simile of Toronto Harbor, and many other examples will occur to you on a little reflection.

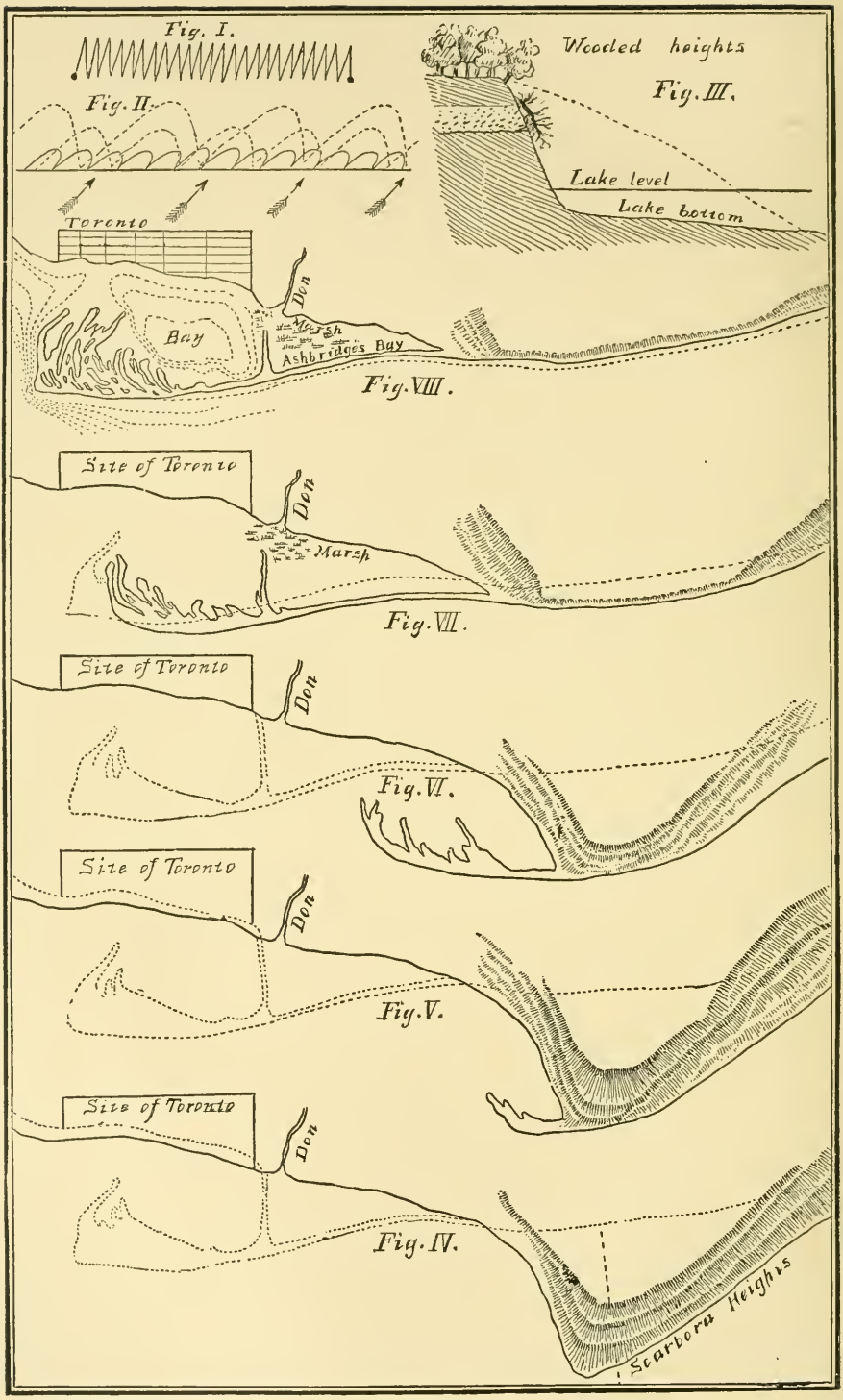
If I had time, I would like to call attention to the formation of the marsh. In the early history of the Don, no doubt, it poured its waters directly into the lake, while the spur, shown in Figure V., was in its infancy, and, at the time it was following Greeley's advice under the powerful influence of the easterly storms, the Don was also trying to obey the same injunction by turning, if not its face, at least its mouth toward the west. But the embryo Island grew more rapidly and soon overhauled the Don, and after a lengthened period of high lake level during which time the young giant was working unseen, came a period of low level, when the Don found its progress menaced by the spit of sand running northward to near the site of the old windmill. I have examined various maps of Toronto for the purpose of obtaining light on this part of my subject. The earliest is Bouchette's, which was made in 1793. This shows that the bar running northward had entirely closed the present mouth of the Don, and that another mouth existed about half way between the mainland and the present gap. At this time, I believe, began the deposits which formed the marsh.

Mr. Lawson, tea merchant, King Street, informs me that he remembers both mouths, the latter being called the big mouth.

Before the Island afforded the protection it does at present these mouths may have been constantly shifting, and at times both may have been closed up. Indeed, some writers tell us distinctly that such has been the case, and that the water of the Don had no visible out-let, but made its way out by filtration through the bar. At such a time sedimentation would go on rapidly.

This is pretty much my own theory—at least I don't saddle it on any one else, though others may have a prior claim to it.

However interesting the subject of the Island formation may be to the scientist, Island preservation is of far greater interest to the financier and business man of Toronto. The reports that reach us of the destruction going on at the east end of the Island are of an alarming character, and it behooves our city guardians to take steps for its preservation before our beautiful Island vanishes from our sight.



Drawing Showing the Development of Toronto Harbor.

CONTRIBUTIONS TO THE MORPHOLOGY AND PHYSIOLOGY OF THE CELL.

By A. B. Macallum, B.A., M.B., Ph.D.,

Lecturer in Physiology, University of Toronto.

(Read 15th November, 1890.)

In the interior of the epithelial cells of the alimentary canal, and in the glandular cells of the pancreas in amphibia, are usually found structures which are of great interest to both the morphologist and the physiologist. Typical examples of these occurring in the gastric mucosa of the salamander have been described and illustrated by Lukjanow,* and one has but to glance over the figures he has given in order to gain an idea of the number and variety of these bodies. They are much more abundant in the intestinal than in the gastric epithelium of a well-nourished animal, and, so far as my observations go, they present, on the whole, a greater complexity of form than those described by Lukjanow. What is the significance of these bodies? With the exception of some of the intranuclear forms, they can, I believe, be arranged in the three following divisions :

1. Parasites.
2. The remains of broken-down cells and nuclei swallowed by the healthy adjoining cells.
3. Material swallowed by the epithelial cell from the food passing over its free surface (in the case of the intestinal epithelium).
4. Plasmosomata migrated or extruded from the nucleus (only in the glandular cells of the pancreas).

It is, no doubt, impossible, in many cases, to determine to which of these classes this or that particular body belongs since intracellular parasites simulate plasmosomata and kindred structures in some stages of their existence, and I propose, therefore, to treat of the structures in a general way, pointing out, wherever possible, their relationship to one or other of the classes given above excepting, however, those connected

* Beiträge zur Morphologie der Zelle—Arch. fur Anat. und Phys., Suppl. Bd. zur Phys. Abth., 1877, p. 66.

with division 3, the treatment of which I postpone until I have finished my experiments on the methods of the resorption of chromatins *(Nucleins)*.

To illustrate the parasitic nature of some of these forms, I will now describe undoubted examples of intracellular parasites from the intestines of the spotted newt and the lake lizard *(Necturus)*.

I. A Cellular Parasite from the Intestinal Epithelium of Diemyctylus Viridescens.

In April of this year I obtained from the neighborhood of Toronto a number of spotted newts for the purpose of studying the phenomena of secretion in the pancreas and in making preparations of this organ I found it frequently convenient, on account of the small size of the animal and its organs, to include the anterior portion of the intestine. In the intestinal epithelium of one of the newts was found a large number of forms like those shown in Figures 3 and 4, and I immediately endeavored to work out their history. Before detailing the results of this work it may be well to state that the particular object from which the sections studied were made was hardened in Flemming's Fluid and alcohol, stained *in toto* with hæmatoxylin, imbedded by the chloroform process in paraffin, the sections therefrom placed in series on the slide and stained with eosin and safranin, before being permanently mounted in balsam.

The structures in question are so numerous that every second or third epithelial cell, for long stretches of the section, contained one of them. They are always placed in the outer half of the cell between the nucleus and the free border, and have a nearly uniform diameter (9-11μ, averaging 10μ) and an approximately spherical shape. They do not appear to have a definite or distinct membrane, and what takes its place appears to be a zone of homogeneous or faintly granular protoplasm which, in many cases, is denser and thicker at one side of the body than at any other. From this zone trabeculae of granular protoplasm pass inwards to terminate in a more or less centrally placed protoplasmic mass. In a number of these bodies sufficient to render the peculiarity prominent, the bulk of the protoplasm is collected at one side (Fig. 3), while the thicker portion of the protoplasmic rim occupies the opposite side with a large crescentic, oval, or round cavity intervening. The protoplasmic mass stains lightly but readily with eosin and contains a round homogeneous nuclear body, which stains deeply with safranin and measures less than 2μ (1.5μ). Sometimes the nuclear body is placed in a cavity in the protoplasmic mass and connected with the latter by a few fine strands. In a few instances, the nucleus was surrounded at a distance by

a distinctly marked membrane which, however, may have been only a thickening of the protoplasm bordering the cavity in which the nucleus was situated.

Not so common, but still quite readily seen, are forms like that represented in Fig. 5, in which, in place of a single nucleus, there are a large number (over twenty) of safranophilous spherules, each surrounded by a small quantity of finely granular protoplasm and marked off from the rest of the mass by a delicate membrane (Fig. 8*d*.) These spherules are homogeneous and measure much less than 1μ. Fig. 6 apparently represents a later stage of the same body, and in this one sees that the homogeneous spherules have become transformed in such a way, that the stained material in each is arranged in a horseshoe or crescentic form, according to the specimen examined (Fig. 6, 7, 8*e*). The comparative scarcity of these forms, the very small size of the objects and the absence of a sharply defined contour to the stained material, render it extremely difficult to determine this arrangement satisfactorily in many cases, but in thin and well stained sections, and with good objectives (2mm. immersion apochromatic, Zeiss), forms like those figured appear now and then.

There can, I think, be no doubt about the parasitic nature of these intracellular bodies, and we may, therefore, regard the stage described in the last paragraph as that of sporulation.

I endeavored to determine the mode of transition from the stage in which there is a single nucleus to that of sporulation. It was not an easy subject for study, because, for every hundred that one observes belonging to both stages, there are not more than one or two forms that can be ranked as transitional. Two of such are represented in Fig. 8*b* and *c*. I have been led to consider them as stages in the formation of spores, because they present structures which resemble somewhat karyokinetic figures. For example, in the form represented in Fig. 8*b*, the centrally placed stained body may be regarded as belonging to the dyaster stage and seen from one of the poles; in it also structures, bearing a resemblance to individual chromatin loops, can be made out. This arrangement comes out well sometimes in preparations stained with hæmatoxylin and safranin, but oftener the safranophilous substance is collected in a ring form resembling, to a certain extent, the equatorial plate of nuclear division. Probably the explanation of Fig. 8*c* is that it represents a multiple form of karyokinesis. The difficulty of determining the nature of such conditions will be readily understood, when it is remembered that the safranophilous bodies are usually not 2μ in diameter, and that, consequently, its metamorphic elements must be very small.

If the determination of the division of the nucleus is difficult, much more so is that of the full history of the spores. They are so small at first that, apart from the mother organism, they cannot be distinguished from other cellular contents, such as the swallowed portions of the debris of neighboring cells and the spore stages of other parasites. It is only in a few cases that circumstances favor the determination of some of the forms after they have escaped. In Fig. 1, for example, is shown a cavity in the interior of a cell, evidently once occupied by the parasite in question, and in the neighborhood of the cavity is a number of bodies like plasmosomata, of similar, or nearly similar size. These are evidently the spores derived from the organism which occupied the cavity. In a few instances, with the best conditions for observation, forms, like those shown in Fig. 9*a*, are seen. Here the structures are comma-shaped, and their resemblance to other forms in the same Figure, to that of Fig. 10*a* and to those in Fig. 2, is such as to suggest a developmental relationship. The probability, however, that very young forms of Sporozoan parasites are similar to those represented in Fig. 9*a*, is sufficient to invalidate any conclusion that might be drawn from this resemblance.*

There is more certainty in regard to the larger comma-shaped forms, such as are shown in Figs. 2 and 10*a*. These are intensely safranophilous bodies, and measure from 3 to 6μ. Their outlines are sometimes distinct, sometimes not, this depending on the way in which the organism is disposed in the field of the microscope. If the tail should happen to be above or below the head of the comma the organism may be recognised with difficulty. The connection between these and the spherulating forms can be seen by glancing at Fig. 10 *a–h*. In further development the head of the comma enlarges, the safranophilous substance collects into a small round mass, leaving the protoplasm which contained it more or less coarsely reticulated or finely granular, and with feeble staining capacity. The tail still retains its safranophilous character and remains distinct for several stages. The space between it and the head tends to increase when its point becomes applied to the head (Fig. 10*c*). At the same time it becomes somewhat elongated (*d*), and the safranophilous substance in it condenses into a thin band bounding the convex side of the crescentic cavity. The head also undergoes further changes (*e*). The protoplasm becomes collected at its periphery as a rim to which the small round safranophilous mass, the nucleus, is attached by delicate protoplasmic strands. In the next stage protoplasmic strands may stretch across the crescentic cavity, to the remains of the tail or the point of the

*Compare with Steinhaus' Figures of the intracellular parasites in the pancreas of the Salamander, Ziegler's Beiträge Zur Path. Anat., Bd. VII., Taf. XI.

tail may fuse with the head; in the latter case the crescentic cavity persists (*l*). The safranophilous substance gradually disappears from the thin band representing the remains of the tail, till finally its staining capacity is scarcely marked in some of the forms, although its density is noticeable. This sketch of the organism developed out of the comma-shaped body explains thus the occurrence of a denser, frequently more deeply staining zone at one side, the presence of a crescentic cavity, or of a cavity next the zone, and the frequently excentric position of the nucleus in the adult organism (Figs. 3 and 4). In individual cases, in which these peculiarities are apparently wanting, it may be that they cannot be observed, because the organisms are not favorably placed in the microscopic field.

We can, I think, now account for many of the forms shown in Fig. 9, especially those in which a deeply stained crescent occurs with a sphere in its cavity—they are merely comma-shaped parasites in the process of transformation into that stage in which sporulation takes place. In the same way we may explain some of the forms illustrated by Lukjanow,* especially his Figs. 14, 15, 16, 61*a* and *b*, 66, 72, 74 and 75, and probably also Figs. 7, 11, 13, 68, 69, 77 and 94. His Fig. 48 would seem to indicate that he saw the sporulating phase of the same organism. All his studies were made on the gastric mucosa of the salamander. I have found in the gastric mucosa of *Diemyctulus* very few abnormal structures of this character. If they are parasitic, their comparative absence from the stomach may be attributed to the digestive and resistent action of the gastric mucosa, and it is probable that the irregularity and atypical character of many of the structures drawn by Lukjanow may be due to the physiological action, during life, of the glandular elements in which they occurred.

It is interesting to note the structure of the cytoplasm around the full-sized organisms (Figs. 3–7). It is constituted of very fine rodlets, each with a thick end directed towards the organism and passing in a radiating manner peripherally into a zone of what appears to be finely granular protoplasm, but which is, probably, a portion of the cytoplasmic reticulum condensed. The border of thickened points in many cases closely resembles a membrane. It depends, apparently, on the vitality of the cell whether the radiating arrangement of the cytoplasm occurs or not. It may be absent, as in Fig. 2, when the cell shows signs of degeneration. It is difficult to understand the function of this mechanism, but we may suppose it to act as a filtering apparatus.

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* *Op. cit.*

II. ON CHROMATOPHAGOUS AND OTHER INTRACELLULAR PARASITES IN THE INTESTINE OF NECTURUS LATERALIS.

In the intestinal epithelium of *Necturus* are often found forms which, from their peculiarities, must be regarded as parasitic. When I observed them first, I considered them to belong in a general way to that class of intracellular structures which Lukjanow* has described as occurring in the gastric mucosa of the salamander, and of which there are not a few examples in the intestine of *Necturus*. They are well shown in preparations made from recently captured animals, and their characters are preserved well in the tissues fixed with Flemming's Fluid, or corrosive sublimate, and stained with alum cochineal, or haematoxylin or eosin.

The chromatophagous forms have usually an irregular outline and the protoplasm extended in one or more long pseudopodial processes, which taper often to fine threads. In some cases the whole organism is thread-like (Fig. 15 *p*). They are easily distinguishable in alum-cochineal preparations in the unstained, epithelial cytoplasm, in which they may be found, and by their stain being in every respect similar to, and as deep as, that of the chromatin bodies of the epithelial nuclei. With high-powered objectives the stain is seen confined to the fine granules which densely crowd the cytoplasm of these organisms. There is sometimes a quantity of unstained protoplasm at the thicker end (Fig. 14 *p*), or a more or less curiously shaped mass may lie in its neighborhood (Fig. 16 *pr*). Sometimes the bodies are found in the interior of nuclei, but, as a rule, they are not easily recognizable in this position, unless they show amœboid outlines or are fixed in the act of migrating from the nucleus. One is shown in the latter condition (Fig. 15 *p*). The nucleus is in this case partially deprived of its chromatin by the parasite, which owes its staining capacity to the chromatin it absorbs or invaginates.

An explanation of the relations of such structures as are shown in Fig. 13 (*p*) can be at best only problematical. Here two parasites, each in a separate cavity in the cytoplasm, have their prolongations hooked around one another. This is only one of several instances observed of such a condition, but the preparation drawn shows the process most distinctly. It may be a case of conjugation.

There are a number of forms which are either wholly unstained by the coloring reagent, or which possess one or more stained spherules or granules (Fig. 13 *p*). These may, in some cases at least, represent young stages of the chromatophagous forms.

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* L. c.

In Fig. 12 is shown a cell from the base of the epithelial layer, which has certain peculiarities worthy of note. In one of its two nuclei is a cavity containing an eosinophilous, dumb-bell-shaped structure. The chromatin of this nucleus is very much condensed, but a portion of it is extended into the cavity in the form of doubly-beaded rodlets. The structure here reminds one strongly of that of the cytoplasm about the parasites in the intestine of *Diemyctylus* as described above, and I am inclined, therefore, to regard the dumb-bell structure as a parasite. The elements in the neighborhood of the second nucleus may be parasitic also. Such a case as this illustrates fairly well upon what slender grounds one has to judge of the parasitic or non-parasitic nature of some intracellular bodies.

III. On Certain Structures in the Pancreatic Cells of Amphibia.

In the pancreatic cells of Amphibia are structures which, since their discovery by Nussbaum,* in 1882, have excited attention amongst a number of cytologists, on account of their supposed participation in the processes of secretion. From the fact that they presented resemblances in position and form to structures described by v. la Valette St. George and Bütschli, as occurring in the testicular cells of some invertebrates, Nussbaum gave them for temporary use the name nebenkerne. It will be seen from the description given below that these elements are not normal portions of the gland cell at all, and, therefore, do not merit the title, which has, since Nussbaum's paper was published, maintained its place in nearly all the publications on the subject. I do not intend to discard the term, however, because the full history of the structures have not been worked out, and they may really belong to a stage of a Sporozoan parasite, whose adult form may already be described and named. In that case the continued use of the term nebenkern applied to these elements is preferable to the coining of a new word for temporary service probably, and I will, therefore, not offer any further excuse for adopting it in this work.

If the elements in question were normal, it might be advisable to give them an English name equivalent to the word nebenkern, in which case the words "paranucleus," or "accessory nucleus" might suffice. The word *cytozoon*, on the other hand, is precluded, since it has been adopted by Gaule and his pupils to denote, according to their views, the elements in certain stages of cell metamorphosis or cell rejuvenescence.

According to Nussbaum's description, the nebenkerne are placed in the

* Uber den Bau und die Thätigkeit der Drüsen. Arch. für Mikr. Anat.. Bd. XXI., p. 296.

protoplasmic portion of the gland cell, between the nucleus and the membrana propria ; they are oval in outline, and either solid or more or less spirally twisted. There may be one or more in each cell, and when one only is present it is usually larger than the several taken together, which may happen to be in another cell. On the fourth to the fifth day after feeding the animal (salamander), they are present in every gland cell, while they may be found with difficulty, or not at all, in animals recently fed, and they are rare in animals which have fasted for a long time.

Nussbaum also found solid nebenkerne in the œsophageal glands of the frog, and in the exhausted, unicellular glands in *Argulus*, and thread-like ones in the pancreas of *Triton*.

As to the nature of these bodies, Nussbaum came to no conclusion. Ogata*, on the other hand, put forward a view which connected them with processes of secretion and cell renewal. According to his account, they are the plasmosomata of the nucleus, which have wandered into the cell protoplasm. The small nebenkerne are homogeneous, spherical, or elliptical in outline, often elongated and do not stain with hæmatoxylin, but they readily imbibe eosin, which, consequently, obscures their presence amongst the similarly stained zymogen granules. In the larger nebenkerne the chromatin substance is present, consequently they are either colored homogeneously violet or have one or more corpuscles colored deep violet to pure blue. The large nebenkern can, on the one hand, in old and exhausted cells, develop into a new cell, which, situated immediately adjacent to the membrana propria, pushes the disintegrating nucleus and remains of the old cell towards the lumen, and increases its own cytoplasm, in which zymogen granules appear ; on the other hand, it may, in ordinary cells, break up into zymogen granules. It depends on the general condition of the gland, whether the nebenkern breaks up into zymogen granules, or developes into a new cell. The production of zymogen is not, however, limited to the nebenkern, for the granules were seen in the process of formation in the nucleus.

Ogata found in the moderately large, as well as in the full-sized nebenkern, cavities and fissures which gave them various appearances. Sometimes the structures were seen to sit cap-like on the nucleus.

Ogata stimulated the pancreas either by pilocarpin or by electrical irritation of the medulla, and found the number of nebenkerne greatly increased. When two or more doses of pilocarpin were given at intervals of twenty-four hours, the resulting number of nebenkerne was smaller

*Die Veränderung der Pankreaszellen bei der Secretion. Arch. für Anat. and Phys., Phys-Abth., 1883, p. 405.

than when only one dose was given. He explains this on the ground that the first dose has greatly increased the number of nebenkerne, and thereby weakened the cells, which now respond to the second dose less readily.

Ogata also traced a relation between the disappearance of the nebenkerne and the appearance of new nuclei.

Platner's* first published views coincided to a certain extent with those of Ogata. His description substantially is this: The large round nucleolus of the pancreatic cell elongates, and moves towards the periphery of the nucleus, often pushing out its membrane. The long axis of the nucleolus corresponds to the radius of the nucleus. A portion of the nucleus becoming constricted off, this part contains the nucleolus and is separated from the main portion by the formation of a homogeneous, septal wall. The nucleolus and the separated portion of the nucleus constitute together the nebenkern, which, when the main portion of the nucleus regains its usual size, sits on it like a demilune. The nebenkern becomes homogeneous, separates from the nucleus and breaks up into granules which are probably zymogen. These observations were made on the pancreas of *Anguis fragilis*, and were corroborated in that of the frog.

Platner's second study† led to somewhat different results. He used for this purpose the pancreas of a number of Reptilian and Amphibian forms, but he obtained the most decided results from that of the salamander. In the latter the irregularly contoured nuclei of exhausted gland cells stain deeply with safranin, so that the nuclear framework becomes indistinct. Of the many or several prominences on each nucleus one only remains finally. Into this the chromatin, distributed throughout the nucleus, wanders, with the result that the prominence appears as a dark red bud on the remaining portion of the nucleus, which now gradually returns to the normal condition, namely, that in which the nucleus shows an unstainable caryoplasma (Kernsaft). These buds are variously shaped, large or small, round or irregular. The nuclear membrane in most of the cases still covers it. Often it has vanished and the contents, still colored deeply, lie as fibrillar or coiled elements, or as partially granulated material, in the protoplasm of the cell. The constriction between the nucleus and the bud deepens, till finally they separate, the bud now losing its uniformly staining capacity. At the same time the protoplasm of

*Uber die Entstehung der Nebenkerne und seine Beziehung zur Kerntheilung. Arch. für Nitr. Anat. Bd., XXVI., p. 343.

†Beitrage zur Kentniss der Zelle und ihren Theilung. Arch. für Mikr. Anat. Bd. XXXIII., p. 180.

the cell increases, till it attains its normal maximum volume. The retrogressive metamorphosis of the nebenkern, as Platner now terms the separated bud, goes hand in hand with the vigorous formation of zymogen granules in the cell. The nebenkern stains less readily with hæmatoxylin, and its volume decreases gradually, till either only fibrillar remains of the same are visible among the zymogen granules, or it is indistinguishable.

It is seen that these observations raise the question how far "partial" chromatolysis, as Platner terms the formation and degeneration of the nebenkern, thus described, enters into the processes of secretion, but Platner leaves the matter undecided.

Platner accounts for the discrepancies in the two descriptions of the mode of formation of the nebenkern by stating that in the pancreas of Anura, which formed the basis of his earlier observations, the determination of the various points is difficult, because of the small size of the cells in which the nebenkern sits cap-like on the nucleus.

Steinhaus* solves the question of the nature of these bodies differently. He denies their normal occurrence in Amphibia. They were not present in the pancreas of six axolotls which he examined and they were also absent from the pancreas of frogs obtained from one locality, though present in those of another. Even in the pancreas of some salamanders they are absent. He states that they have no connection with the processes of secretion, as the formation of zymogen granules goes on as well in the cells deprived of these bodies, as in those possessing them. They lie unchanged and, so far as the formation of zymogen granules is concerned, inert in the cell protoplasm. He never saw any structures which proved either the origin of these bodies out of the constituents of the cell, or their conversion into zymogen granules, or their connection with cell renewal. Steinhaus studied the condition of the nucleus in all the phases of secretion, but could observe nothing which would be considered as nuclear budding, according to Platner's description.

Steinhaus gives no verbal description of the nebenkerne, but in his figures he represents them as varying in size and number in each cell and as thread or worm-like forms more or less coiled, some of the larger ones of which have one end of the thread thickened to resemble a head.

Steinhaus considers these bodies as parasites whose relationship to the Hæmatozoa is unmistakable, but so long as we know only this stage

*Ueber parasitäre Einschlüsse in den Pancreaszellen der Amphibien—Ziegler's Beiträge zur Path. Anat. und zur Allgem. Path., Bd. vii., p. 367.

in their life-history, it is impossible to say anything more definite than that everything at present determined points out their kinship to the Sporozoa.

It is of interest here to note the occurrence of supposed nebenkerne in the pancreas of the dog.* Melissinos and Nicolaides found that these are intra- as well as extranuclear forms, sometimes of curious shape and composition. The intranuclear ones, the plasmosomata, may wander from the nucleus into the cell substance, where, as these observers are led to believe from the results of experiments with pilocarpin, they break up into zymogen granules. They deny the correctness of Platner's view, that the appearances, from which Ogata was led to believe that nuclear plasmosomata migrate into the cell, are artificially produced, and, in support of their position, they mention that in a quarter of an hour after the administration of pilocarpin the plasmosomata show all the stages of migration from the nucleus, the extranuclear forms are numerous and zymogen granules are present, while in half an hour after the administration, neither plasmosomata, extranuclear forms, nor zymogen granules are visible. The extranuclear forms, which arise by migration from the nucleus, of the plasmosomata, they call nebenkerne and these they distinguish from others, which are more or less complicated in their structure and composition and which lie in distinct cavities in the cell protoplasm. These latter they think are: (1) excretions of the cell protoplasm ; (2) the remains of leucocytes ; (3) chromatolysed nuclei.

METHODS OF STUDY.

I used several methods at the outset of this research but finally gave the preference to one mode of preparation which included either Flemming's Fluid or corrosive sublimate as the hardening reagent. This mode of preparation was as follows :

The animal (*Diemyctylus viridescens*, *Amblystoma punctatum*, *Plethodon glutinosus*) was decapitated, the abdominal cavity opened, the pancreas snipped away and immediately dropped into a saturated solution of corrosive sublimate, where it remained ten to fifteen minutes, or into a quantity of Flemming's Fluid, where it was left from one to twenty-four hours, according to the need. The operation of removal was usually done within twenty seconds, this interval including the decapitation process also. The object of this was to prevent any post-mortem

*Untersuchungen über einige intra- and extranucleare Gebilde im Pankreas der Säugethiere auf ihre Beziehung zu der Secretion. Von C. Melissinos. Mitgetheilt von R. Nicolaides. Arch. für Anat., und Phys., Phys. Abth., 1889, p. 317.

changes in the pancreatic cells and I believe that it was attained in every case. The piece of tissue was after removal from either of these fluids, washed for a few seconds in distilled water, then transferred to 70% alcohol for three hours, in the case of the corrosive sublimate preparation, and for twenty-four hours, when the Flemming's Fluid was used. When the latter was allowed to act longer than one hour, the alcohol was changed as often as it presented a trace of chromic acid coloration. The hardening was completed by a stay of twenty-four hours in 95 per cent alcohol. The organ was now transferred to the staining fluid, alum hæmatoxylin, (a few drops of a saturated solution of hæmatoxylin in absolute alcohol to a saturated solution of pure ammonia alum in distilled water: allowed to stand one month in summer sunlight before using, and kept from deterioration by crystals of thymol), for ten to fifteen hours. In order to prevent overstaining, I found it advisable to dilute the original hæmatoxylin solution with twice its volume of distilled water, in which dilution, after the time allowed, there is only a pure chromatin stain in the nuclei of the pancreatic cells and a faint shade of purplish blue in the nebenkerne. The objects are now washed in distilled water to remove the alum and the excess of the staining fluid, and are then put in a quantity of a 1 per cent solution of eosin in 30 per cent alcohol for from two to three hours. Washed in 95 per cent alcohol, till the latter was but faintly colored with the eosin after one hour's action, the object was placed in absolute alcohol for five minutes, then in pure chloroform for fifteen hours on the average, after which it was kept in a saturated solution of paraffin in chloroform at 35°C. for about eight hours, and finally placed for a like period in melted paraffin (melting point 52°C). The sections were made of a thickness not exceeding 5μ with the Thoma-Yung microtome and fixed by the ribbon method in series to the slide with a diluted Schällibaum's clove oil-collodion mixture, (clove oil 1 volume, collodion 3, equal parts of absolute alcohol and ether 3). I used, sometimes in the case of the corrosive sublimate preparations, the Gaule method of fastening the paraffin sections to slide, but, as the process of staining on the slide was not employed, except when the action of saffranin was required, it did not present any points of advantage over the other, which was the quicker. The paraffin was removed with benzole and the sections mounted in benzole balsam.

The staining of the object as a whole with hæmatoxylin and eosin has the advantages of giving a regular and uniform depth of reaction in the various sections and the different parts of each, and of preventing the loss of important elements entailed by the process of staining on the slide. I found that a little practice enabled one to judge of the length

of time necessary to give the tissue its proper depth of stain, and I determined that a stay of eight or ten hours longer than usual in the diluted hematoxylin solution, did not seem to increase the depth of the stain, or to make it more diffuse. Probably the explanation of this is that the equilibrium between the coloring matter in the diluted solution and that deposited in the tissue is reached when the chromatin is saturated. This, of course, is merely an application of the principle, that length of time and degree of concentration are elements in the right employment of staining methods and that these are, roughly speaking, in inverse proportion to one another.

In order to determine if the nebenkerne contribute in any way to the elaboration of the secreted elements of the pancreas I resorted to the use of pilocarpin. I had a large nnmber of *Diemyctyli* at my disposal, and on these I studied the action of the drug, so far as the nebenkerne are concerned. Batches of ten, twenty and thirty were taken, and into the abdominal cavities of each of these less than 2 mgrm. of pilocarpin was injected. Three of these were, at certain periods after the injection, decapitated, the pancreas of each removed, hardened with corrosive sublimate, and treated as described above. These periods were usually: 1, 2, 3, 4, 5, 7, 9, 12, 17, 22, 36, 44, 52 and 60 hours, and these were chosen in some cases for convenience. I took three at each period, because, if I depended on one, misleading results might be obtained. It was found that the averages of the results obtained from each three agreed with each other in presenting an unbroken outline of the history of the nebenkerne.

I treated very young forms of *Amblystoma punctatum* also with pilocarpin, the method of employment of the latter in this case being to dissolve twenty to fifty milligrams in about half a litre of water and placing the animals therein for a period of five to twelve hours. As they measured between thirty and thirty-five millimetres in length, it is obvious that an intra-abdominal injection of a solution of the drug was out of the question.

The specimens of *Necturus* kept in the laboratory aquarium were not used for this investigation, since, owing to their not having been fed for a long time, the pancreas presented a more or less atrophied condition. It was found impossible to stimulate the gland in these to activity, or even to make it secrete at all.

There is a great advantage to be obtained from the concurrent use of the two hardening reagents, corrosive sublimate and Flemming's Fluid. The former fixes thoroughly and quickly the zymogen granules as well as the cellular and nuclear structures in the pancreas, while with Flem-

ming's Fluid, though the cell structure and nucleus are well preserved, the zymogen is dissolved out of all the cells except those at the immediate periphery of the organ. This removal of the zymogen is due to the acetic acid in the fluid, which penetrates where another constituent of the same mixture, osmic acid, is unable to diffuse. The action of acetic acid in this reagent enables us to distinguish between zymogen and other granules which have the same staining capacity with eosin. The osmic acid, furthermore, gives a dark tinge to the nebenkerne and unusual bodies in those cells near the periphery and thus brings them out in clear contrast to the other cytoplasmic structures.

OBSERVATIONS.

In sections made from the pancreas of *Diemyctylus*, which has been hardened with Flemming's Fluid and stained with hæmatoxylin and eosin, one observes in addition to the nucleus and cell protoplasm and, sometimes, zymogen granules, other structures which can be ranged in two groups at least. One of these groups comprise forms whose fundamental structure elements are thick or thin fibrillæ, either in sheaf shape, or wound in a ball fashion (Fig. 1). Sometimes the fibrillæ may be so thick as to merit the designation threads (Fig. 8). These forms are usually but not always, placed between the nucleus and the membrana propria, and they frequently sit, cap-like, on the nucleus, or the latter may be indented by them. In the second group, which are, at the outset, unlike the first, in that they are placed in cavities of the cell, are structures which present a varied form and composition. They are sometimes eosinophilous, sometimes chromophilous, and at times they present both characters, They are numerous in the pancreas of a freshly captured animal, but are not so much so as the members of the first group.

The members of these two groups of intracellular elements have been confused by other observers, and Ogata describes them as derived from the plasmosomata migrated from the nucleus, while Steinhaus appears to believe they are all parasites. In order to show that the views of these observers are hasty generalizations from a limited number of results, I propose to go fully into the description of the structure origin, mode of production, and history of each group. As plasmosomata, migrated, or extruded from the nucleus, are sometimes present, and as they have a different history, they merit special attention as a third group. These three groups may then stand in the order of description as follows:

1. Parasites.
2. The remains of broken down cells and nuclei swallowed by healthy adjoining cells.

3. Plasmosomata, migrated, or extruded from the nucleus into the cell protoplasm.

1. Parasites.

These are, as already said, usually, but not always, placed between the membrana propria and the nucleus of the cell. They vary in size, measuring in their extreme limits 1μ and 9μ, and their shape, usually oval, may also be oblong, spherical, elongated, club-like, or crescentic in section. They are not very sharply separated from the protoplasm of the cell and if the latter is dense, their outlines are distinguished with difficulty. Their structure varies also, but there are certain features in this respect which are tolerably constant for the great majority of these forms. These are the central cavity and the fibrillated appearance, the fibrillæ, as a rule, appearing as if wound around the central cavity. The central cavity may contain from one to several zymogen-like granules. The fibrillæ do not appear as if wound tightly, but are more or less tortuous in their course and the outermost ones may appear ragged, or project loosely into the surrounding protoplasm. This fibrillated arrangement is best seen in Flemming's Fluid preparations from freshly captured *Diemyctyli*, and, especially, in those on which the reagent has been allowed to act for twenty-four hours. The osmic acid and the hæmatoxylin in such give these bodies a dark brown stain, which deeply contrasts with the lightly or non-stained, surrounding protoplasm. In corrosive sublimate preparations, on the other hand, the fibrillation usually does not appear so distinct except under high powers when it readily becomes manifest, and hrimatoxylin gives it a faint reddish violet stain. Zymogen granules are entangled in the peripheral fibrillæ, often so abundantly, that they obscure the presence of the organism in question.

This stage is the most common, but in order to understand its nature, it will be necessary to consider the characters of the other forms found even in the same sections. These present more the appearance of plasmodia, are usually much smaller, and they take a deeper and more uniform stain with eosin. In the protoplasm of these, one can, at times, see concentric laminated slits, which are apparently an indication of a tendency to form fibrillæ, but which may also indicate that these plasmodia-like masses are derived by the fusion of the protoplasm of a coiled thread. Such coiled threads are rarely seen in ordinary preparations, but very frequently in sections from the pancreas of some *Diemyctyli*, which have fasted for about two months (Fig. 8). These coils have been, now and again, found to be dense in sections from the pancreas removed fifty to sixty hours from the animal after the injection of p lo-

carpin. When these bodies are very small, the number of turns in the coil is not more than two or three, whereas in the largest forms the number of turns cannot usually be made out.

All the forms, then, are either plasmodia-like masses, or are composed of fibrillæ or threads. Whether the plasmodia are elements of a separate stage in the metamorphosis of the bodies, or whether they are merely formed by the fusion of the protoplasm of the threads, cannot be decided definitely. It can certainly be determined that the fibrillated stage is one of degeneration, for one can find the fibrillated forms in all conditions up to disappearance. Figs. 1, 2, 3, 4, and *6nb* show this. The first step in this consists in a more or less parallel straightening of the fibrillæ and a consequent flattening of the whole mass, then the cell protoplasm pushes it towards the periphery where it lies, usually, directly under the cell membrane (Figs. 2, 3, and *4nb*). Here the fibrillæ disintegrate one by one, till finally, owing to their fineness and small number, they can not be distinguished from the cell protoplasm. Platner has described the occurrence of such fibrillated remains in the cell protoplasm, and he considers them derived from the nebenkerne.

I am inclined to believe that the coiled thread is the intact form of the parasite, and that the plasmodium-like mass may be either an earlier or a subsequent stage in the life history of the parasite. In the case of the latter form, the fact, that it is usually smaller than those in which the fibrous or fibrillated structure is manifest, tends to show that it is a younger stage, but not conclusively, since even small fibrillated masses occur sometimes.

I have withheld the proofs that these forms are parasitic till now. Of course each fact adduced is not of itself sufficient to prove the correctness of my view, but all taken together are conclusive in this respect. These facts may be summarized in the following items :—

They are not present in the pancreas of the great majority of young forms of *Amblystoma punctatum.* I sectioned the whole of the pancreas of seven of these and found these bodies in only two of them. Of these two, one contained only eleven of the structures, while the rest possessed hundreds, and in both these cases, as well as in the other five, the cells exhibited all stages in secretion. I treated five other larvæ with pilocarpin, and examined the pancreas at intervals of four, seven, eleven, thirteen, and twenty-two hours after, without finding a single specimen of this nebenkern. The larva, in which the greatest number of such were found, measured in total length a little over thirty millimetres, while the others were of the same length or some what longer, and we may conclude, therefore, that the occurrence of these bodies does not depend on the stage of

development, although it may depend on the change in the food, or habitat, which the increased development entails.

2. They are present in all the cells of the actively secreting pancreas of *Diemyctylus*, as well as in that of an animal fasting for two months or more. When two or more are present in a cell, they are, usually, but not always, small. I have found them present in the cells apparently without diminution in number at every indicated interval, after the injection of pilocarpin. In corrosive sublimate preparations of the gland cells distended with zymogen granules, these bodies are, in many cases, not seen. If one relied wholly on corrosive sublimate as a hardening reagent, one might conclude that this is a stage in which the nebenkerne are absent, having been used up in the formation of zymogen, and such a conclusion has been advanced by Ogata. That the bodies are not absent, but merely obscured by the granules, is shown in preparations made with Flemming's Fluid from a pancreas in the same condition. This reagent dissolves out the zymogen in the centrally placed tubules, and, if allowed to act for twenty-four hours, blackens the structures in question, thereby showing them to be as numerous in this phase of cellular activity as in any other. I have, however, found that they, as a rule, stain somewhat more readily with eosin at certain intervals after injections of pilocarpin, and this condition is concurrent with the filling up of the exhausted cell with zymogen, and with a subsequent exhaustion of the same. The deeper stain during the formation of zymogen is due to absorption of the latter diffused from the nucleus, its seat of formation, while, in the other case, the cells, having their energy exhausted, cannot destroy or disintegrate the organisms, which absorb the cell juices and thereby attain a greater readiness for eosin. I think this latter condition is in some way connected with the vitality of the animal, for it is less apt to appear in vigorous animals, and I found it best exemplified in sluggish ones, while in some cases, again, it appeared in forty-five to fifty-five hours after the administration of one dose of pilocarpin.

3. They are not derived from the nucleus by constriction and partial chromatolysis, as Platner describes, although other structures described farther on, with which these have been confused, may be so derived. I have examined series of sections made from the pancreas of over seventy *Diemyctyli*, exhibiting all the phases of glandular activity and yet I have never in a single instance seen the bodies in question, in any way, derived from the nucleus, nor are they plasmosomata which have migrated from the nucleus and have undergone a certain amount of extranuclear development, a thesis which Ogata adopts and defends. I have found extranuclear plasmosomata, and, as will be seen from the description

further on, traced their history, which is totally unlike that of the structures in question. Given, then, that they are derived neither from the cell protoplasm nor from the nucleus, the only remaining conclusion possible is that they come from without—in other words, they are parasitic.

4. The parasitic nature of these bodies is best shown by their form in the two young *Amblystomata* referred to above. Fig. 10 *a*, *b*, *c*, *e*, *f (nb)*, represent the commoner types of these and a resemblance to a "wurmchen" type is readily seen in these.

5. The fibrillation and gradual disappearance of these bodies occur without any participation whatever in the processes of cell activity and secretion. There can be no doubt about the correctness of this, and moreover, Platner's description practically admits it, although he thinks that the desintegration of these bodies furnishes material for an increase in the amount of the cell protoplasm and, possibly, of its zymogen. It is not to be denied that the desintegration and possible assimilation of these bodies increase the cell protoplasm and may, therefore, very indirectly assist in the formation of zymogen.

The statements made by Steinhaus that these structures are not derived from the cell or nucleus, that they have no functional relation to secretion, nor have anything to do with cell renewal, I can, therefore, fully confirm. His observation that they are inconstant even in the same species, agrees with mine as to the young *Amblystomata*. His figures, however, of these bodies resemble but few of mine, and show the "würmchen" form to be more common than I have been permitted to see in my preparations. If Platner's statement is correct, that the fibrillar remains of these bodies can be observed in the pancreas of the salamander, it is evident that Steinhaus has overlooked the full history of the structures. Steinhaus is also in error in concluding that the parasites alone are the nebenkerne of Ogata or Platner, for bodies have evidently been included in this class by the two observers, which are not parasitic at all.

What are these parasites? Steinhaus believes that they are similar to, not to say identical with, those described under the names Hæmatozoa and Cytozoa. There are several facts which speak for the correctness of this view. The forms of some of them correspond with that found in the blood cells of the frog, the "würmchen" of Gaule and known as *Drepanidium ranarum* of Lankester. The latter is also to be found in the blood of *Diemyctylus*. Kruse* states, however, that it is not present in the blood of the tadpole and this fact is to be taken in connection with the absence,

* Virchow's Arch., Bd. 120, p. 553.

generally, of the pancreatic parasites in young *Amblystomata*, if an explanation is desired of the latter phenomenon. Furthermore, the degeneration and disintegration of the pancreatic parasites and the complete absence of the reproductive processes show that some other tissue is the breeding ground of the parasite, and their presence in every pancreatic cell points to the blood as their source.

The destruction of such large numbers of the parasites in the pancreatic cells seems to indicate that the pancreas of Amphibia is a protective as well as a secretive organ, and that it plays this part specially, since the parasites have not been found in any other organ after the most careful search.

2. Karyolytic and Cytolytic Products.

These elements are few in some *Diemyctyli*, abundant in others, the latter especially in freshly captured animals. They are found only in groups of the cells at certain spots in the sections and they present characters which definitely distinguish them from the elements described in the foregoing section. Probably the best representation of these forms is given by a glance at Figs. 6 *chm*, 4 *rchc*, *pmeg*, 5 *pm*.

Their form is usually spherical or approximately so, and their size, as well as their structure, varies. They often consist of chromatin and eosinophilous substance, or simply of protoplasm which has a special affinity for staining reagents. Less commonly, they may contain eosinophilous granules like the zymogen granules, or these may be present with the chromatin masses. Apart from the occurrence of eosinophilous granules and the slightly stained protoplasm, the structure of these bodies is mostly varied by the quantity of chromatin present and the form which it takes. Sometimes the whole of the structure seems composed of chromatin (Figs. 3 and 6 *chm*), but more frequently the latter forms a small oddly shaped mass irregularly placed in the structure. One may see rings, rods, crescents, hooks, and spirals formed of this substance and variously disposed in the protoplasmic mass carrying them. These bodies usually lie in the cavities in the protoplasm of the containing cell, a peculiarity which readily brings them to view when their affinity for staining reagents is very slight. These elements are sharply distinguished from the parasitic bodies in that they never fibrillate and they, moreover, have a different fate. The latter can only be studied in the pancreas of freshly caught animals, and in those in which the various phases of the resting cells are being developed. In the active gland they may be numerous but as the resting phase of the gland cell is step by step being established they are found to become correspondingly smaller, the staining

with hæmatoxylin less vivid, while the larger bodies disintegrate and the fragments become scattered through the cell. The disappearance of these elements, the concurrent increase in the cell protoplasm and the appearance of zymogen granules are not matters of physiological relation. The removal, or rather the disappearance of chromatin, is on the other hand in some way connected with the abundance of chromatin in the greatly enlarged nucleus of the containing cell (Figs. 3, 4, 5, and 6). The nucleus may be somewhat distorted in its shape, and this is without doubt due to the abundance of the chromatin which it has absorbed from the elements in the cell. The processes of disintegration and absorption go on till finally in the resting gland cell a few protoplasmic masses, scarcely larger than zymogen granules, may remain.

The origin of these bodies is to be sought for in the broken down gland cell. Indeed one can see them so derived in the sections. In Figs. 3 and 5 are some of the remains (*cm* and *rohe*) of such disintegrated cells lying in the intercellular spaces, while the surrounding cells contain masses, which, from their position, are evidently swallowed portions of the same. The farther a cell is removed from these intercellular masses the freer it is from the intracellular elements in question and at a distance not greater than the diameter of a cell these may be absent altogether. In other words, wherever one finds the intracellular bodies numerous one can also in the same or in the next section find intercellular elements to indicate the place of origin of the former. It is quite possible that disintegrated leucocytes may give rise to the same, but I have seen no evidence of such, except, perhaps, in such forms as that represented in Fig. 6*a*.

These bodies are also present more or less in the pancreas of all the young *Amblystomata* examined and they exhibit here also the same varying composition and structure.

These bodies do not participate in the processes of secretion. The presence of eosinophilous granules, like those constituting the zymogen, led Ogata to consider them as breaking up into zymogen and from the fact that the parasites may appear to contain zymogen granules more or less imbedded in them, he concluded that the latter are earlier phases in this formation of zymogen. These eosinophilous granules are not formed of zymogen, however, because in the more centrally placed cells in a section of the pancreas prepared with Flemming's Fluid, the zymogen granules are dissolved out by the acetic acid in this reagent, but the eosinophilous granules are not affected. This phenomenon has a bearing on the mode of secretion and I will, therefore, forego an explanation of it till I come to this subject farther on.

Nothing can probably demonstrate more effectually the non-secretory nature of these elements than the fact that they are present in the cubical cells lining the ducts and ductlets of the gland (Figs. 11 *b*, *chm* and 12 *rchc*). Nor are these bodies confined to the pancreas, for I have found them in the ephithelial cells of the intestine, in the liver, the kidney and cutaneous epithelium of *Diemyctylus* and *Necturus*. They indicate, however, how little of a tissue is normally lost to itself and how it husbands its waste material. It is, of course, on first view, surprising that the pancreatic cells should exhibit amœboid properties, but it is less so when we remember that the hepatic cells, which in sections have a definite and apparently fixed form, manifest in the teased out scrapings from the cut surface of the fresh liver amœboid movements.

3. Migrated or Extruded Plasmosomata.

Platner denies that the nuclear plasmosomata migrate, and, at first, I was inclined to this view. It is easy to see in well hardened sections of the pancreas plasmosomata driven by the knife from the periphery of the nucleus into the cell, the nuclear membrane torn, and the cavity previously occupied by the plasmosoma empty. This occurs chiefly when the plasmosomata are large and placed next to the nuclear membrane. The apparent protrusion of the nuclear membrane, in some cases, is really due to a shrinking of the same at every part, except opposite the plasmosoma, which offers a resistance. I found, however, as the investigation proceeded that there were phenomena which could not be so explained. For example, in the pancreas of a young *Amblystoma*, about one-fourth of the nuclei showed plasmosomata which were fixed in the act of passing from the nucleus to the cell. I saw plasmosomata of dumb-bell form half outside and half within the nucleus and some were embedded in the cell protoplasm. I saw this condition, moreover, but less marked, in the pancreas of a specimen of *Diemyctylus* removed twenty hours after the injection of pilocarpin. Though the evidence was unmistakeable, I cannot but think that if the phenomena are constant or normal, they should be observed oftener. In any case the migration or extrusion has, from all that I see, no connection with the processes of secretion. If it is a case of extrusion, one might imagine it to occur readily in the pancreas of any specimen of *Diemyctylus*, unless one were to suppose that in certain stages of cell activity the nucleus is more contractile. My attempts to establish the correctness of such a supposition resulted unsuccessfully.

That the extrusion or migration is not a normal phenomenon appears to be borne out in the history of the extranuclear plasmosomata. They either disintegrate and form granules like that of zymogen in size and

staining reaction, or persist for a time in a cavity of the cell protoplasm and gradually loose their eosinophilous character. Forms of the latter are rare but they can be distinguished from the cytolysed products of other cells by the fact that they are more or less eosinophilous, and by the fact further, that one only is to be found in a cell, while similar bodies, protoplasmic or otherwise, are absent from the adjoining cells. For the purposes of the diagnosis of course serial sections are necessary. But with these aids even, the process of determining whether a slightly eosinophilous, extranuclear mass is a plasmosoma derived from the nucleus is a difficult one. The disintegration into zymogen-like granules is easily distinguishable on account of the fact that the resulting granules are collected at one spot in the cell (not near the border) and from their resisting the action of acetic acid. It is possible, on the other hand, that a plasmosoma may neither disintegrate into zymogen-like granules, nor persist with the gradual loss of the eosinophilous character in the cell protoplasm. I observed in the pancreas removed from an animal one and a half hours after the injection of pilocarpin, the ductlets filled with zymogen in a granular condition and containing here and there a large plasmosoma-like mass. In this case no intra-cellular plasmosomata were observed, although zymogen was still present in the cells. I think this phenomenon indicates that the pancreatic cell can, under such a strong stimulus as pilocarpin furnishes, throw out of itself all material not part of its own mechanical structure, and that the extranuclear plasmosomata may, in some cases, be disposed of in this way.

That Ogata made the mistake he did in assuming that the extranuclear plasmosomata become converted into nebenkerne and the latter again into zymogen granules is very natural in view of what is described above. The passage of plasmosomata from the nucleus to the cell, the mingling of zymogen granules, either with the substance of the plasmodium-like mass or with the fibrillæ of the degenerated parasite and the occurrence of protoplasmic masses loaded with eosinophilous granules are demonstrable facts which Ogata seems to have observed, and he built up from these the theory outlined, a feat and a mistake which any cytologist, who had paid as careful attention to the subject as Ogata did, might have committed at that time. What was less excusable was the construction of a theory of cell rejuvenescence, for although chromatolysis was then unknown, or at least undescribed, and, therefore, the occurrence in pancreatic cells of protoplasmic masses possessing chromatin unexplained, yet the knowledge concerning the indirect process of cell division had then made a great advance and it was hardly necessary to postulate the existence of another process. All things considered, however, Ogata's

work has been of great service in calling special attention to structures, the further study of which may definitely establish a new function for the pancreas in cold-blooded animals, viz., a protective one against the Hæmatozoic parasites.

In connection with these remarks on Ogata's views, I may mention that I have frequently observed in some sections of the pancreas of *Diemyctylus* examples of karyokinesis and that in the cells in this condition there were neither nebenkerne, protoplasmic masses, nor plasmosomata. Steinhaus gives an illustration of a pancreatic cell exhibiting karyokinesis in which, apparently also, nebenkerne (parasitic) are present. I have also frequently observed cell and nuclear division in the pancreatic cells of the young *Amblystomata* and it was apparent that the nuclear division might go on with the cell more or less filled with zymogen granules.

4. Zymogenesis.

It has been known from the researches of Haidenhain and others that changes in the shape and staining power of the nucleus accompany the change from the resting to the active phase of the secreting cell. What the relations are which these changes bear to one another, were not divined, but it was generally supposed that they were the results of increased or decreased nutrition. The observations of Platner and Steinhaus embrace one aspect of these changes *i. e.*, the staining power of the nucleus, and it is to this that I propose to devote this section.

A summary of Platner's views as to the changes in the staining power of the nucleus of the pancreatic cell has been given above in the historical sketch of the literature on the pancreatic nebenkerne. Steinhaus'* observations, bearing more directly on the staining power, are of greater interest to us and may be abstracted as follows :

The exhausted gland cells are small, indistinctly contoured, and deficient in protoplasm and their arrangement in the form of alveoli is lost. Their nuclei which are angular and crenated are, when a double stain of hæmatoxylin and safranin is employed, colored red, and their nucleoli are safranophilous. When the active phase of the cells begins, the cytoplasm increases, the contour of the cell becomes distinct, the arrangement in alveoli with central lumen is attained, while the form of the cell becomes bluntly conical. At the same time the nucleus becomes oval and stains readily with hæmatoxylin. This dye stains one sort of nucleoli, the karyosomata, while the safranin colors the other and larger kind, the plasmo-

* *op. cit. p.* 371.

somata. At this point the formation of zymogen granules begins in the part of the cell next the lumen and it proceeds till the cell is filled with them. As to the origin and mode of production of the zymogen granules nothing is known. When secretion begins these granules disappear and the nucleus now tends to return to the condition found in the exhausted cell.

My own observations coincide with those of Steinhaus. I may emphasize here one or two points. The nucleus of the exhausted gland cell stains readily and deeply with safranin, that of the cell in which the formation of zymogen is going on vigorously, is colored deeply with hæmatoxylin, while its plasmosoma takes readily the safranin.

My explanation of this phenomenon is drawn from the results of my observations on the formation of yolk in the ovarian ova of *Necturus* and *Rana*, and a summary of these may therefore not be out of place here.

In the nuclei of the developing ova at a certain stage the chromatin is principally collected in the form of nucleoli at the periphery immediately under the nuclear membrane. These nucleoli are usually spherical and they may, though not usually, or very much, vary in size. All the chromatin of the nucleus is not so situated, for there are long threads which at certain points in the granular karyoplasma unite at angles with one another. At this stage yolk spherules are absent from the cell. If now sections of such an ovary are stained with the indigo-carmine stain of Shakespeare and Norris, the significance of the peripheral nucleoli is determined. Such sections show here and there an ovum in which the peripheral nucleoli are stained deep blue, while the remainder of the nucleus and cell is stained red. In other ova, again, the peripheral nucleoli and the karyoplasma are stained blue, the cell red, while in others again the peripheral nucleoli are smaller, the whole ovum, with its yolk spherules which now begin to be formed, is stained blue, or blue green.

The origin of the substance which stains indigo-blue in this process is certainly derived from the peripheral nucleoli, for it is possible to meet with an ovum once in a while in which a portion of the karyoplasma in the immediate neighborhood of and around each nucleolus is, like the latter, stained indigo-blue, while the remainder of the karyoplasma is red. The peripheral nucleoli generate a substance, therefore, which diffuses gradually through the nucleus, then into the cell protoplasm, the point in time of the latter occurrence corresponding with the formation of the yolk spherules. The mode of origin is through a process of deposition from the nucleus of a substance allied to chromatin in the cytoplasm.

The diffusion of a substance produced from the nucleoli through the

nucleus and into the cell protoplasm, can also be determined by other staining reagents, *e.g.*, alum cochineal, but the different stages in this phenomena cannot be thereby so readily determined as with the other method.

I regard the yolk spherules as formed by the union of a derivative of the nuclear chromatin with a constituent of the cell protoplasm. This derivative of the nuclear chromatin is, possibly, the same as the hæmatogen which Bunge discovered in the fowl's egg united with an albumin. The formation of yolk spherules in the cell protoplasm is analogous to the the formation of zymogen granules in the pancreatic cells and both are accompanied by changes in the nucleus and an increase in the cell protoplasm. It is most natural to conclude that the processes underlying the formation both of the yolk spherules and of the zymogen granules are in a general way alike. We see many facts supporting this view. In the developing ovum there are phases in the elaboration of the chromatin and the formation of nucleoli (plasmosomata) comparable to the production of chromatin in the nucleus of the resting pancreatic cell, and to the apparent conversion of this chromatin into safranophilous substance which diffuses through the nucleus in the exhausted cell. We see a further parallel to the formation of yoke spherules in that as the nucleus loses its safranophilous substance the cell protoplasm acquires safranophilous granules. If we accept the parallel so far as correct, we may then assume that the chromatin of the nucleus of the pancreatic cell gives rise to a substance which we may call "prozymogen," sometimes dissolved in the nuclear substance, sometimes collected in masses (plasmosomata), and finally diffused into the cell protoplasm, uniting with a constituent of the latter as zymogen. This is, I think, the true explanation of the phenomena of secretion.

With the help of this theory we can explain why it is that in certain pancreatic cells the protoplasmic masses contain, as described above, eosinophilous granules of exactly the same size as those of zymogen, but unlike the latter in that they are not dissolved out by solutions containing acetic acid. The protoplasmic masses swallowed by a pancreatic cell, cannot be of the same composition as the cell protoplasm, and are not amenable to the laws which govern the nutrition of the cell as a whole. When the prozymogen diffuses from the nucleus to the cell it invades the protoplasmic masses enclosed, and it becomes united with a constituent of the latter, thereby forming a compound similar to zymogen in some respects: the capacity for forming spherules, the eosinophilous and safranophilous reaction, but differing from it, as already said, by being insoluble in solutions of acetic acid.

That the nucleus is the seat of formative energy is shown by a number of observations*, especially those which bear on the vegetable cell. In the latter the first stages, at least of starch formation, are carried out in the nucleus and this secretes a compound which is finally converted by the the cytoplasm into starch. Korschelt† has also determined that in the formation of the chitinous processes on the eggs of *Nepa* and *Ranatra* the chitin necessary for each process is elaborated in a cavity between and surrounded by two epithelial nuclei, and the only legitimate conclusion from such a circumstance is that the chitin is derived from a nuclear substance. I may also here refer to the fact that my own observations have definitely shown that the hæmaglobin of the red corpuscles in *Necturus* and *Amblystoma* is derived from the chromatin of the nucleus both of the fully formed as well as of the developing red cell, and that the hæmaglobin so formed diffuses through the nuclear membrane and becomes fixed in the cytoplasm. All these facts point definitely to the prominent part played by the nucleus and if everything in connection therewith is carefully studied, it will be admitted, I believe, that the interpretation which I have given of the changes occurring in the nuclei of the pancreatic cell during the various phases of glandular activity, is not a strained or a far-fetched one.

APPENDIX.

After the foregoing was written, a paper containing the observations of Eberth‡ on the pancreatic nebenkerne in salamander came into my hands. In this is advanced a new view of the relations of these bodies, or pseudo-nuclei, as Eberth prefers to call them. He states that they are developed out of the reticular fibrillæ of the cytoplasm, the latter at spots apparently becoming swollen, or thickened by fusion with their neighbors, and at the same time altered in composition, whereby their

* See a resumé of such researches in Strasburger: "Ueber Kern-und Zelltheilung im Pflanzenreiche nebst einem Anhang über Be fruchtung," Jena, 1888, pp. 194-204.

†"Ueber einige interessante Vorgänge bei der Bildung der Insecteneier." Zeit. für wess. Zool. Bd. 45.

‡Neber Einschlüsse in Epithelzellen. Fortschritte der Medicin, Sept. 1., 1890.

capacity for absorbing staining reagents is increased. Later several of such bent fibrillæ approach one another and acquire the shape of a sickle, semicircle, or circle. The latter show all possible stages of transformation into the laminated bodies and spherules, which possess a very irregular fibrillation appearing to consist of loose threads, while they may at times resemble laminated colloid bodies. The pseudo-nuclei disappear during hunger, while becoming gradually paler and less easily stainable. As to the process and manner of disintegration Eberth could offer no explanation. He compares these bodies with structures described by Czermak as occurring in the ethmoid cartilage of the calf, and with those found by Solger in the cartilage cells of the shoulder-girdle of the pike. Eberth believes these structures to be normal, and, in a sense, comparable to the nodules of the nuclear network.

Eberth states that the employment of corrosive sublimate as a hardening reagent and of paraffin for imbedding produces contraction and shrinkage in these objects, and that then one obtains the peculiar shapes which possess a certain resemblance to Cytozoa. He accordingly recommends Rabl's Fluid or Flemming's Fluid for hardening and celloidin for imbedding.

Now I have carefully gone over the whole of my preparations since last October, and have during this winter made a number of new preparations from *Diemyctyli* and young *Amblystomata*, using for this purpose each of the three hardening reagents mentioned, frequently on pieces of the pancreas from the small animal. I have found that Rabl's Fluid often gives the appearance of coarse, parallel fibrillation in the pancreatic cells, when neither Flemming's Fluid nor corrosive sublimate demonstrated the presence of a single nebenkern in the parts of the pancreas hardened with either of these reagents. Such a parallel arrangement of coarse fibrillæ is probably artificially produced. It appears also to cause a swelling of the cytoplasmic fibrillæ, whereby these are rendered more distinct, and I think that to this property is due the advantage obtained by the employment of Rabl's Fluid in demonstrating the elements of the achromatic spindles in dividing nuclei.

My later observations strongly confirm my view that the nebenkerne are parasitic elements. In eight *Amblystomata*, killed during January and February, there were nebenkerne in only one, and here very abundantly. There could be no doubt about the sharply outlined form, as Steinhaus has figured it, often homogeneous but as often fibrillated. I have seen quite distinctly the thickened portion of the organism which simulates a head. As the *Amblystomata* kept in the laboratory tank were

not regularly fed, I attribute the intact form possessed by many of the parasites to the lowered vitality of the host produced by want of food.

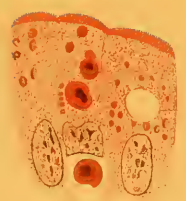
Eberth's views are directly opposed to mine. He considers the fibrillation of the structures in question not as an evidence of their degeneration, but as a stage in their formation. His observations, confined as they were to one form, cannot, I think, be held as conclusive by any one who has studied the changes in the pancreas of Amphibia as exhibited throughout the year. I cannot share Eberth's views as to the action of corrosive sublimate on the form of these bodies and that it does not produce a contraction or shrinkage, as he maintains, is shown by Figs. 1, 2, 9, and 10*d*, *nb*, which were drawn from preparations made with this reagent. I would call attention to Fig. 10*b*, *nb*, which shows a form not at all uncommon in the specimen of *Amblystoma* referred to in the last paragraph and which is very like some of the specimens of *Drepanidium* figured by Gaule.

I have, in this connection, made further observations on the elaboration of the pancreatic ferment. The results of these are confirmatory of the views already advanced by me and may be summarized as fo lows :—

1. In the gland cell filling up with zymogen granules, the latter are largest at the border of lumen of the gland tubule, while the smallest are found at that edge of the granular area nearest the nucleus. This serves to show that the granules are increased in volume by the deposition of a substance from the "protoplasmic" area of the gland cell.

2. While the eosinophilous substance disappears from the nucleus, the "protoplasmic" zone becomes eosinophilous at a time nearly coinciding with the commencement of the deposit of granules in the cell. In other words, the eosinophilous (or safranophilous) substance diffuses out the nucleus to the protoplasmic zone of the cell, from which it is apparently removed to be fixed in some way in the zymogen granules.

3. In the gland cell after exhaustion and when a restoration of its active condition commences there is an absorption, apparently from without, of chromatin, or of a chromatin-like substance, by the protoplasmic zone, and it would seem that the nucleus increases its quantity of chromatin from this source.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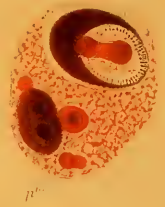
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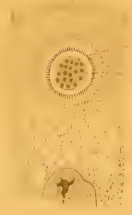
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14.
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15.
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p'
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16.
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pv

Explanation of Plate I.

The illustrations are drawn with the Abbe camera lucida, combined with the 3mm. or the 2mm. apochromatic objectives (Zeiss), and compensation ocular 4 or 8.

Figs. 1-11 are from the intestine of *Diemyctylus viridescens.*

Fig. 1. Three epithelial cells in each of which there are unusual structures—*cp* represents the cavity in which, apparently, a parasitic element matured and whose spores are seen in the adjacent cytoplasm. In the central cell are probably both spores and invaginated, cytolysed material, while in the cell to the left there are structures which from their shape appear to be parasitic. ×720.

Fig. 2. Two epithelial cells in one of which the nucleus is degenerated. In both cells are seen structures exemplifying two stages in the development of the same parasite. In the degenerated cell the parasite, *p*, is matured, but in the cytoplasm of the other cell, they are, apparently, all comma-shaped. ×1000.

Fig. 3. A single epithelial cell containing a fairly typical specimen of the parasite, *n*, the cellular nucleus, *np*, the nucleus of the parasitic organism. There is present a cavity and a rim of thickened protoplasm, *pr*.

Fig. 3*a*. An epithelial cell in which the parasite, *p*, is in the stage of transition from the comma to the adult form. ×1000.

Fig. 4. In this the parasite, *p*, possesses a central mass of protoplasm in which is imbedded the nucleus and which sends processes toward the periphery. The remains of the tail of the comma are still recognisable in the denser portion of the periphery. ×1000.

Figs. 5, 6, and 7. The sporulation stages of the parasite with the trabecular arrangement of the cell protoplasm *pc*, well marked. The horseshoe form of the spore is clearly shown in 6*a*. ×1000. 6*a*. ×2250.

Fig. 8. Represents five stages in the development of the sporulation phase of the parasite. In *a* the thickened band of protoplasm at one side represents the remains of the tail of the comma stage; in *b* the two central rings probably represent a stage of mitosis which is further advanced in *c*; in *d* the spores are formed each in a cavity of the ptoor plasm and these are further developed in *e*. ×1000.

Fig. 9. Represents illustrations of comma forms met with in the epithelial cells. In *a* coiled form is shown. ×1000.

Fig. 10 *a-d.* are illustrations showing the way in which the comma is transformed into the adult parasite; *e-l* represent forms which show the various ways in which the nucleus, cavity and tail are disposed in the adult or developing form. ×1000.

Fig. 11*a.* Represents a section of an epithelial cell in a cavity of which are enigmatical structures, the larger one probably being parasitic, the others may be either parasitic or protoplasmic masses with chromatin spherules. ×1000.

Fig. 11*b.* In this cell are a number of structures all of which are evidently parasites. ×1000.

Fig. 12. A cell found in the epithelial layer of the intestine of *Necturus*, *n*, the nucleus, *p*, plasmosomata-like masses which may be parasitic, n^1, a nucleus in which the chromatin is principally massed at one side and continued into the cavity in the form of doubly beaded rodlets; a dumb-bell shaped body, deeply eosinophilous, is shown in the act of migration from the cavity. ×660.

Fig. 13. Epithelial cells of the intestine of *Necturus; n*, the epithelial nuclei; *l*, the nuclei of leucocytes; *p*, two intracellular parasites lying in cavities of the cell. ×660.

Fig. 14. Intestinal epithelial cells of *Necturus; p*, parasitic elements; *l*, the nucleus of a leucocyte. ×660.

Fig. 15. Intestinal cells of *Necturus; p*, parasites migrating from from nucleus; p^1, either invaginated, cytolysed material or stages in the development of the parasite. ×600.

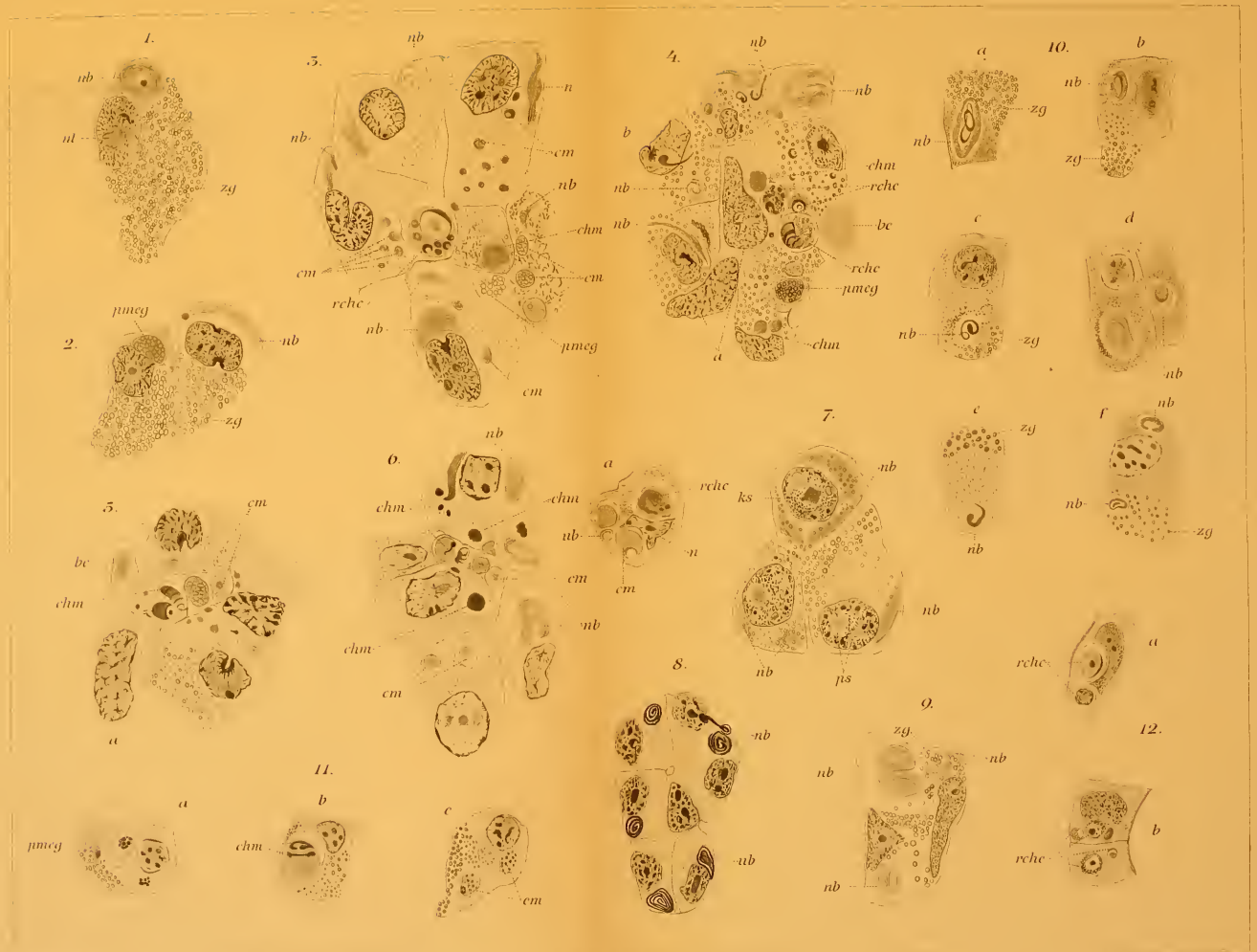
Fig. 16. A single epithelial cell of the intestine of *Necturus*, showing a large cavity in its proximal part occupied by a parasite *p*, and protoplasmic remains, *pr.* ×600.

EXPLANATION OF PLATE II.

The outlines of all the figures were made with Abbe's camera lucida in combination with 2mm. apochromatic objective and compensation ocular, 4 or 8. In the case of Fig. 8 the drawing was made at the foot instead of at the level of the stage of the microscope, hence the difference in the magnification.

bc, blood corpuscle.

cm, cytolysed masses.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chm, chromatin masses or bodies derived from chromatolysed nuclei.

pmeg, protoplasmic bodies loaded with eosinophilous granules like zymogen, but insoluble in acetic acid.

nb, nebenkern.

rchc, remains of chromatolysed nuclei and cells.

zg, zymogen granules.

Fig. 1 A resting pancreatic cell from *Diemyctylus; nl*, a large irregular plasmosoma; the chromatin is very abundant. Corrosive sublimate. Hæm., eosin. ×1000.

Fig. 2. Two resting pancreatic cells from the same preparation as the last. In the right hand cell the elasticity of the fibrils of the degenerated nebenkern has sprung out the cell wall. ×1000.

Fig. 3. From the active pancreas of *Diemyctylus*. Illustrates the invagination by normal cells of cytolysed material. The cavity in the centre occupied by the round mass, *rchc*, was probably the site of the cytolysed cell, and from this the cytolysed products have passed to the surrounding cells. The part represented occupied the centre of the section and the meshes of the cytoplasmic network were filled with zymogen granules which were dissolved out by the acid hardening reagents. It is to be noted that the nuclei here are large and rich in chromatin. Flemming's Fluid. Hæm., eosin. ×1000.

Fig. 4. Taken from near the margin of a similarly prepared section and therefore showing zymogen granules; *a*, enlarged nuclei; *b*, a nucleus with a sickle-shaped element, half within and half without the cell. ×1000.

Fig. 5. From the resting pancreas of *Diemyctylus*. The part drawn was from near the margin of the section. In the centre of the illustration is shown a cavity or intercellular space partially occupied by cytolysed material and the chromatin derived from it is found in the adjacent cell *(chm)*, whose nucleus is greatly enlarged. The other nuclei are somewhat irregular and rich in chromatin. Flemming's Fluid. Hæm., eosin, safranin. ×1000.

Fig. 6. From the central part of a section from the pancreas of a freshly captured specimen of *Diemyctylus*. Here also are shown free intercellular masses, and in the adjacent cells spherules of chromatin and cytoplasm; *a* represents a single cell from the same preparation. Flemmings Fluid. Hæm., eosin. ×1000.

Fig. 7. Three pancreatic cells from *Diemyctylus*. The formation of zymogen has advanced somewhat, the chromatin is abundant and the

karyosomata numerous and sometimes large *(ks)*. The plasmosomata of which there are two to each nucleus are usually large and irregular in shape. Corrosive sublimate. Hæm., eosin. ×1000.

Fig. 8. From the pancreas of a specimen of *Diemyctylus* deprived of food for five weeks. Corrosive sublimate. Hæm., eosin.

Fig. 9, From the pancreas of a specimen of *Diemyctylus* removed forty-five hours after an intra-abdominal injection of 0.4mgrm of pilocarpin. Corrosive sublimate. Hæm., eosin. ×1000.

Figs. 10 and 11. From the pancreas of specimens of *Amblystoma punctatum* (developing into adult condition). Fig. 10, *a-f*, drawn from the same pancreas. Corrosive sublimate. Hæm., eosin. ×1000.

Fig. 12. Cells lining the pancreatic ductlets of *Diemyctylus*, showing in their interior cytolysed and chromatolysed products *a* and *b*, from the pancreas 24 hours and one hour respectively after the intra-abdominal injection of pilocarpin. Corrosive sublimate. Hæm., eosin. ×1000

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American Academy of Political and Social Science ..... "
American Journal of Photography ..... "
Prof. Daniel G. Brinton, M.D. ..... "
The "Book-Mart" ..... Pittsburg, Pa.
Wyoming Historical and Geological Society ..... Wilkesbarre, Pa.
Rhode Island Historical Society ..... Providence, R.I.
Newport Natural History Society ..... Newport, R.I.
University of Virginia ..... Charlottesville.
Wisconsin Academy of Science, Arts and Letters ..... Madison.
State Historical Society of Wisconsin ..... "
Society of Alaskan Natural History and Ethnology ..... Sitka, Alaska.
—132

(3.)—MEXICO.

Museo Nacional de México ..... México.
Sociedad Cientifica, "Antonia Alzate" ..... "
Sociedad Mexicana de Geografia y Estadistica ..... "
Observatório Meteorologico-Magnético Central ..... "
Deutscher Wissenschaftlicher Verein ..... " —5

(4.)—SOUTH AMERICA AND WEST INDIES.

Instituto Historico, Geographico, e Ethnographico do Brazil ..... Rio de Janeiro.
Annaes da Escola de Minas de Ouro Preto ..... "
Sociedade de Geographia de Lisboa no Brazil ..... "
Museu Nacional do Rio de Janeiro ..... "
Observatorio ..... "
Jardin Botanique ..... "
Academia Nacional de Ciencias en Córdoba ..... Republica Argentina.
Museo Nacional de Buenos Aires ..... "
Instituto Geografico Argentino, Buenos Aires ..... "
Museo de la Plata, Buenos Aires ..... "
Le Directeur Général de Statistique de la Province de Buenos Aires ..... "
Sociedad Cientifica Alemana, Santiago ..... Chili.
Museo Nacional, San José ..... Costa Rica.
Instituto Americano, Cartago ..... "
La Sociedad "Amantes de la Ciencia," Lima ..... Peru.
Royal Agricultural and Commercial Society of British Guiana ..... Demerara.
Institute of Jamaica ..... Kingston, Jamaica.
—17

II.—EUROPE.

(1.)—GREAT BRITAIN AND IRELAND.

ENGLAND.

Birmingham Natural History and Microscopical Society ..... Birmingham.
Journal of Microscopy and Natural Science ..... Bath.
Scientific Enquirer ..... "

Bristol Naturalists' Society ..... Bristol.
Cumberland and Westmorland Association for the Advancement of Literature and Science ..... Carlisle.
Cambridge Philological Society ..... Cambridge.
Cambridge Philosophical Society ..... "
Royal Geological Society of Cornwall ..... Penzance.
Royal Institution of Cornwall ..... Truro.
Literary and Philosophical Society of Leeds ..... Leeds.
Literary and Philosophical Society of Liverpool ..... Liverpool.
Liverpool Polytechnic Society ..... "
Liverpool Biological Society ..... "
Royal Geographical Society ..... London.
Royal Astronomical Society ..... "
Royal Microscopical Society ..... "
Royal Society ..... "
Victoria Institute ..... "
Quekett Microscopical Club ..... "
Society for Psychical Research ..... "
Anthropological Institute of Great Britain and Ireland ..... "
Royal Colonial Institute ..... "
Linnean Society of London ..... "
Geological Society of London ..... "
London Mathematical Society ..... "
Institution of Civil Engineers ..... "
British Museum ..... "
British Museum, Natural History Section ..... "
Palestine Exploration Fund ..... "
Patent Office ..... "
Trübner's Record ..... "
Physical Society of London ..... "
National Association for the Advancement of Social Science ..... "
Sanitary Institute of Great Britain ..... "
"Chemical News" ..... "
Imperial Federation League ..... "
Iron and Steel Institute ..... "
"Iron" ..... "
The "Electrician" ..... "
Royal Institution of Great Britain ..... "
Aristotelian Society for the Systematic Study of Philosophy ..... "
Society of Arts ..... "
Society of Antiquaries of London ..... "
Literary and Philosophical Society of Manchester ..... Manchester.
Manchester Geological Society ..... "
Manchester Association of Engineers ..... "
Manchester Geographical Society ..... "
Society of Antiquaries of Newcastle-upon-Tyne ..... Newcastle-upon-Tyne.
North of England Institute of Mining and Mechanical Engineers ..... "
Midland Institute of Mining, Civil and Mechanical Engineers ..... Barnsley.
Somersetshire Archæological and Natural History Society ..... Taunton. —51.

SCOTLAND.

Aberdeen Philosophical Society ..... Aberdeen.
Dumfriesshire and Galloway Natural History and Antiquarian Society . Dumfries.

Royal Society of Edinburgh ..... Edinburgh.
Society of Antiquaries of Scotland ..... "
Royal Scottish Society of Arts ..... "
Royal Physical Society ..... "
Edinburgh Botanical Society ..... "
Edinburgh Geological Society ..... "
Royal Scottish Geographical Society ..... "
Library of the University of Edinburgh ..... "
Philosophical Society ..... Glasgow.
Glasgow Geological Society ..... "
Natural History Society of Glasgow ..... "
Institution of Engineers and Shipbuilders of Scotland ..... "
Library of the University of Glasgow ..... "
Greenock Philosophical Society ..... Greenock. —16.

IRELAND.

Royal Irish Academy ..... Dublin.
Royal Dublin Society ..... "
Royal Geological Society of Ireland ..... "
Institution of Civil Engineers of Ireland ..... "
Naturalists' Field Club ..... Belfast.
Belfast Natural History and Philosophical Society ..... " —6

(2.)—AUSTRIA-HUNGARY.

Société Archéologique ..... Agram.
Société Hongroise de Géographie ..... Budapest.
L'Académie des Sciences ..... Cracovie.
Historischer Verein für Steiermark ..... Graz.
Siebenbürgischer Verein für Naturwissenschaften ..... Hermannstadt.
Institut für österreichische Geschichtsforschung ..... Innsbruck.
Società Istriana di Archeologia e Storia Patria ..... Parenzo.
K. Böhmische Gesellschaft der Wissenschaften ..... Prag.
K. K. Universitäts-Sternwarte ..... "
Naturhistorischer Verein "Lotos" ..... "
Verein für die Geschichte der Deutschen in Böhmen ..... "
Museo Civico di Storia Naturale di Trieste ..... Trieste.
Società Adriatica di Scienze Naturali ..... "
K. K. Akademie der Wissenschaften ..... Wien.
K. K. Geologische Reichsanstalt ..... "
K. K. Geographische Gesellschaft ..... "
K. K. Zoologisch-Botanische Gesellschaft ..... "
K. K. Naturhistorisches Hofmuseum ..... "
K. K. Central Anstalt für Meteorologie und Erd-Magnetismus ..... "
K. K. Gradmessungs-Bureau ..... "
Anthropologische Gesellschaft in Wien ..... "
Wissenschaftlicher Club in Wien ..... "
Oesterreichischer Ingenieur-und Architekten-Verein ..... "
Internationales Permanentes Ornithologisches Comité ..... " —24

(3.)—BELGIUM.

Académie Royale des Sciences, des Lettres et des Beaux Arts de Belgique ..... Bruxelles.

Société Royale de Botanique de Belgique ..... Bruxelles.
Société Royale Belge de Géographie ..... "
Musée Royal d'Histoire Naturelle de Belgique ..... "
Société Royale Malacologique de Belgique ..... "
Société Liégeoise de Littérature Wallonne ..... Liège.
Société Royale des Sciences ..... "
L'Université Catholique ..... Louvain.
Prof. Dr. E. Pasquier ..... " —9

(4.)—DENMARK.

Kongelige Bibliotheket ..... Copenhagen.
Kongelige Danske Videnskabernes Selskab ..... "
Kongelige Nordiske Oldskrift Selskab ..... "
Nordisk Tidskrift for Filologi ..... " —4

(5.)—FRANCE.

Société Linnéenne du Nord de la France ..... Amiens.
Société de Géographie commerciale de Bordeaux ..... Bordeaux.
Académie Nationale des Sciences, Arts et Belles-Lettres ..... Caen.
Société Nationale des Sciences naturelles de Cherbourg ..... Cherbourg.
Académie des Sciences, Arts et Belles-Lettres de Dijon ..... Dijon.
Union Géographique du Nord de la France ..... Douai.
Académie de La Rochelle ..... La Rochelle.
Société Géologique de Normandie ..... Le Havre.
Société Géologique du Nord ..... Lille.
Société de Géographie de Lille ..... "
Revue Biologique du Nord de la France ..... "
Société Bretonne de Géographie ..... Lorient.
Société pour l'Étude des Langues Romanes ..... Montpellier.
Société de Géographie commerciale ..... Nantes.
Académie des Sciences, Inscriptions et Belles-Lettres ..... Toulouse.
Annales des Mines ..... Paris.
Annales des Ponts et Chaussées ..... "
Société des Ingénieurs Civils ..... "
Société Nationale des Antiquaires de France ..... "
Société Géologique de France ..... "
Société Académique Indo-Chinoise de France ..... "
Société d'Ethnographie ..... "
Société Américaine de France ..... "
Société d'Anthropologie de Paris ..... "
Bibliothèque Nationale ..... "
Société de Géographie ..... "
Alliance Française pour la Propagation de la Langue Française ..... "
Musée Guimet ..... "
"Cosmos" ..... "
"Électricité" ..... "
Association Française pour l'Avancement des Sciences ..... "
Journal des Sociétés scientifiques ..... "
Revue scientifique ..... "
Revue de Linguistique et de Philologie Comparée ..... "
Société Zoologique de France ..... "
Société Mathématique de France .....

Feuille des Jeunes Naturalistes.....Paris.
Tablettes Coloniales..... "
Comptes Rendus des Séances de l'Académie des Sciences..... "
Bulletin d'Histoire Ecclésiastique et d'Archéologie Religieuse des Diocèses de Valence, Gap, Grenoble, et Viviers..... Romans. —40.

(6.)—GERMANY.

Naturforschende Gesellschaft zu Freiburg.....Baden.
Königliche Preussische Akademie der Wissenschaften.....Berlin.
Gesellschaft Naturforschender Freunde..... "
Gesellschaft für Erdkunde..... "
Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte.. "
Bibliographie der Staats und- Rechtswissenschaften..... "
Archiv der Mathematik und Physik..... "
R. Friedländer und Sohn..... "
Naturhistorischer Verein der Preussischen Rheinlande und Westphalens...Bonn.
Verein für Naturwissenschaften zu Braunschweig.....Braunschweig.
Naturwissenschaftlicher Verein.....Bremen.
Geographische Gesellschaft..... "
Naturforschende Gesellschaft.....Danzig.
Naturwissenschaftlicher Verein "Isis".....Dresden.
Verein für Erdkunde..... "
Senckenbergische Naturforschende Gesellschaft.....Frankfurt-am-Main.
Naturwissenschaftlicher Verein des Regierungs-Bezirkes.....Frankfurt-an-der-Oder.
Dr. Ernst Huth..... "
Oberhessische Gesellschaft für Natur-und Heilkunde.....Giessen.
Oberlausitzische Gesellschaft der Wissenschaften.....Görlitz.
Königliche Gesellschaft der Wissenschaften.....Göttingen.
Verein für Erdkunde.....Halle.
Naturwissenschaftlicher Verein.....Hamburg.
Verein für Naturwissenschaftliche Unterhaltung..... "
Naturhistorisches Museum zu Hamburg..... "
Geographische Gesellschaft.....Hannover.
Naturhistorischer Verein für Niedersachsen..... "
Historischer Verein für Niedersachsen..... "
Naturhistorisch-Medicinischer Verein.....Heidelberg.
Universitäts-Bibliothek.....Jena.
Verein für Naturkunde..... Kassel.
Anthropologischer Verein in Schleswig-Holstein.....Kiel.
Naturwissenschaftlicher Verein für Schleswig-Holstein..... "
Ostpreussische Physikalisch-Oekonomische Gesellschaft.....Königsberg.
Naturforschende Gesellschaft zu Leipzig.....Leipzig.
Königlich-Sächsische Gesellschaft der Wissenschaften..... "
Verein für Erdkunde zu Leipzig..... "
Museum für Völkerkunde..... "
Königlich-Baierische Akademie der Wissenschaften.....München.
Deutsche Gesellschaft für Anthropologie, Ethnologie und Urgeschichte.. "
Görres-Gesellschaft (Historisches Jahrbuch)..... "
Geographische Gesellschaft..... "
Société Botanique Bavaroise..... "
Westfälischer Provinzial-Verein für Wissenschaft und Kunst.....Münster.
Naturhistorische Gesellschaft zu Nürnberg.....Nürnberg.

Germanisches Nationalmuseum ..... Nürnberg.
Verein für Naturkunde ..... Offenbach-am-Main
Historische Gesellschaft für die Provinz Posen ..... Posen.
Zeitschrift für Physiologische Chemie ..... Strassburg.
Kaiserliche Universitäts- und Landes-Bibliothek ..... "
Verein für Vaterländische Naturkunde in Würtemberg ..... Stuttgart.
Nassauischer Verein für Naturkunde ..... Wiesbaden. —52.

(7.)—ICELAND.

Islenzka Fornleifafélags ..... Reykjavik. —1.

(8.)—ITALY.

Società Italiana dei Microscopisti ..... Acireale.
R. Accademia Petrarca di Scienze, Lettere ed Arti ..... Arezzo.
R. Accademia delle Scienze dell' Istituto di ..... Bologna.
Ateneo di Brescia ..... Brescia.
Società Storica per la Provincia e Antica Diocesi di Como ..... Como.
R. Istituto di Studi Superiori in Firenze ..... Firenze.
Società Italiana di Antropologia, Etnologia, e Psicologia Comparata ..... "
Sezione Fiorentina della Società Africana d'Italia ..... "
Società Entomologica Italiana ..... "
Società di Lettura e Conversazione Scientifiche ..... Genova.
Società Ligustica di Scienze Naturali e Geografiche ..... "
Società Ligure di Storia Patria ..... "
R. Accademia Lucchese di Scienze, Lettere ed Arti ..... Lucca.
R. Accademia di Belle Arti ..... Milano.
R. Istituto Lombardo di Scienze e Lettere ..... "
Società Italiana di Scienze Naturali ..... "
Società Veneto-Trentina di Scienze Naturali ..... Padova.
Nuova Notarisia ..... "
Società Toscana di Scienze Naturali ..... Pisa.
Gazzeta Chimica Italiana ..... Palermo.
Circolo Matematico di Palermo ..... "
Società Siciliana per la Storia Patria ..... "
R. Accademia di Scienze, Lettere, e Belle Arti di Palermo ..... "
Direzione del Giornale del Genio Civile ..... Roma.
Società Geografica Italiana ..... "
R. Comitato Geologico d'Italia ..... "
R. Accademia dei Lincei ..... "
Accademia Pontificia de' Nuovi Lincei ..... "
Bullettino di Bibliografia e di Storia delle Scienze Matematiche e Fisiche ..... "
Specula Vaticana ..... "
"Cosmos" di Guido Cora ..... Torino.
Archivio di Letteratura Biblica ed Orientale ..... "
R. Accademia delle Scienze ..... "
Notarisia, Commentarium Phycologicum ..... Venezia.
R. Istituto Veneto di Scienze, Lettere ed Arti ..... " —35

(9.)—NETHERLANDS.

Koninklijke Akademie van Wetenschappen ..... Amsterdam.
Kon. Zoologisch Genootschap "Natura Artis Magistra" ..... "
Kon. Nederlandsch Aardrijkskundig Genootschap ..... "

École Polytechnique de Delft ..... Delft.
Koninklijk Instituut voor de Taal-, Land- en Volkenkunde van Nederlandsch-Indië ..... 'S Gravenhage.
Société Hollandaise des Sciences ..... Harlem.
Fondation de P. Teyler van der Hulst ..... "
Nederlandsche Botanische Vereeniging ..... Leiden.
Nederlandsche Dierkundige Vereeniging ..... "
Recueil des Travaux Chimiques des Pays-Bas ..... "
Koninklijk Nederlandsch Meteorologisch Instituut ..... Utrecht. —11

(10.)—NORWAY.

Musée de Bergen ..... Bergen.
Polytekniske Forening ..... Kristiania.
Forening til Norske Fortidsmindersmerkers Bevaring ..... "
Videnskabs Selskabet ..... "
Kongelige Norske Frederiks Universitet ..... "
Nyt Magazin for Naturvidenskabernes ..... "
Norwegische Commission der Europæischen Gradmessung ..... "
Tromsö Museum ..... Tromsö. —8

(11.)—PORTUGAL.

Sociedade de Geographia de Lisboa ..... Lisboa.
Académie Royale des Sciences de Lisbonne ..... "
"Gazette du Portugal" ..... " —3

(12.)—ROUMANIA.

Institut Météorologique de Roumanie ..... Bucarest. —1

(13.)—RUSSIA.

Société des Naturalistes à l'Université Impériale de ..... Kharkow.
Société des Naturalistes à l'Université de St. Wladimir ..... Kiew.
Societas Scientiarum Fennica ..... Helsingfors.
Société de Géographie de Finlande ..... "
Tifliser Observatorium ..... Tiflis.
La Section Caucasienne de la Société Impériale Russe de Géographie ..... "
Société Impériale des Naturalistes de Moscou ..... Moscou.
Société Physico-chimique Russe à l'Université de ..... S. Pétersbourg.
Comité Géologique ..... "
La Société Impériale Russe de Géographie ..... " —10.

(14.)—SPAIN.

"Crónica Cientifica" ..... Barcelona.
"Revista Tecnologico Industrial" ..... "
Real Academia de Ciencias Naturales y Artes ..... "
Real Academia de Ciencias Morales y Politicas ..... Madrid.
Real Academia de la Historia ..... "
Sociedad Geográfica de Madrid ..... " —6.

(15.)—SWEDEN.

Kongliga Universitetet ..... Lund.
Kongliga Fysiografiska Sällskapet ..... "

Kongliga Svenska Vetenskaps-Akademien ..... Stockholm.
Kongliga Bibliotheket ..... "
Stockholms Hogskola ..... "
Svenska Sällskapet för Antropologi och Geografi ..... "
Geologiska Förening i Stockholm ..... "
"Acta Mathematica" ..... "
Kongliga Universitetet ..... Upsala. —9.

(16.)—SWITZERLAND.

Geografische Gesellschaft von Bern ..... Bern.
Naturforschende Gesellschaft in Bern ..... "
Schweizerische Naturforschende Gesellschaft ..... Frauenfeld.
Société de Physique et d'Histoire Naturelle ..... Genève.
Société de Géographie de Genève ..... "
Institut National Génevois ..... "
Société Vaudoise des Sciences Naturelles ..... Lausanne.
Société Neuchâteloise de Géographie ..... Neuchâtel.
Naturforschende Gesellschaft in Zürich ..... Zürich. —9.

III.—ASIA.

(1.)—INDIA.

Asiatic Society of Bengal ..... Calcutta.
Geological Survey of India ..... "
Editor of the "Record" ..... "
Survey of India Department ..... "
"Indian Antiquary" ..... Bombay.
Government Central Museum and Library ..... Madras.
"Orientalist" ..... Kandy, Ceylon.—7

(2.)—STRAITS SETTLEMENTS.

Journal of the Straits Branch of the Royal Asiatic Society ..... Singapore. —1

(3.)—JAPAN.

University of Tōkyō ..... Tōkyō.
Asiatic Society of Japan ..... "
Deutsche Gesellschaft für Natur- und Völkerkunde Ostasiens ..... "
Literature College of Imperial University of Japan ..... "
College of Science, Imperial University of Japan ..... "
Tōkyō Anthropological Society ..... " —6

(4.)—JAVA.

Bataviaasch Genootschap van Kunsten en Wetenschappen ..... Batavia.
Nederlandsch-Indische Maatschappij van Nijverheid en Landbouw ..... " —2

(5.)—CHINA.

China Branch of the Royal Asiatic Society ..... Shanghai.
Observatory of Hong Kong, and Government Publications ..... Hong Kong.
His Excellency the Governor of Hong Kong ..... " —3

(6.)—COCHIN-CHINA.

Société des Études Indo-Chinoises ..... Saigon. —1

IV.—AFRICA.

(1.)—ALGERIA.

Société Archéologique du Départment de Constantine ..... Constantine.
Société de Géographie et d'Archéologie de la Province d'Oran ..... Oran.
Académie d'Hippone ..... Bône. —3

(2.)—CAPE COLONY.

South African Philosophical Society ..... Cape Town. —1

(3.)—EGYPT.

Institut Égyptien ..... Le Caire. —1

V.—AUSTRALASIA.

(1.)—AUSTRALIA.

Royal Society of New South Wales ..... Sydney.
Royal Geographical Society of Australasia ..... "
Department of Mines, New South Wales ..... "
Linnean Society of New South Wales ..... "
Board of Technical Education ..... "
Australasian Association for the Advancement of Science ..... "
Royal Society of Queensland ..... Brisbane.
Royal Society of Victoria ..... Melbourne.
Public Library of Victoria ..... "
Government Statist ..... " —10.

(2.)—NEW ZEALAND.

New Zealand Institute ..... Wellington. —1.

(3).—TASMANIA.

Royal Society of Tasmania ..... Hobarton. —1.

TOTAL ..... 516.

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